THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 27 NEW YORK, SEPTEMBER, 1929 No. 9

A Modern Aluminum Casting Plant

Full Pyrometric Control, X-Ray Testing Department and Other Modern Features in the New Fairfield, Conn., Plant of the Aluminum Company of America

DESIGNED to fill the requirements of eastern users of aluminum castings, the new plant of the Aluminum Company of America at Fairfield, Conn., is an ideal example of all that is modern and efficient in casting manufacture. The plant, which is operated by the company's subsidiary, The United States Aluminum Company, was completed early in 1929. It is located directly across the road from the company's old plant and is indeed a contrast to the small brick structure which it

The Fairfield Plant as Seen from the Outside

supplants. Within its four acres of space, all one-story, brick and steel (and aluminum) construction there are the most carefully conceived results of a great deal of experience and experiment in aluminum and aluminum-alloy casting. The plant is completely under pyrometric control. It is electrified as far as practicable. It has chemical and physical laboratories as well as photomicrographic and X-ray departments. No element has been overlooked in the effort to obtain highest grade products with the very minimum of guesswork or hazard.

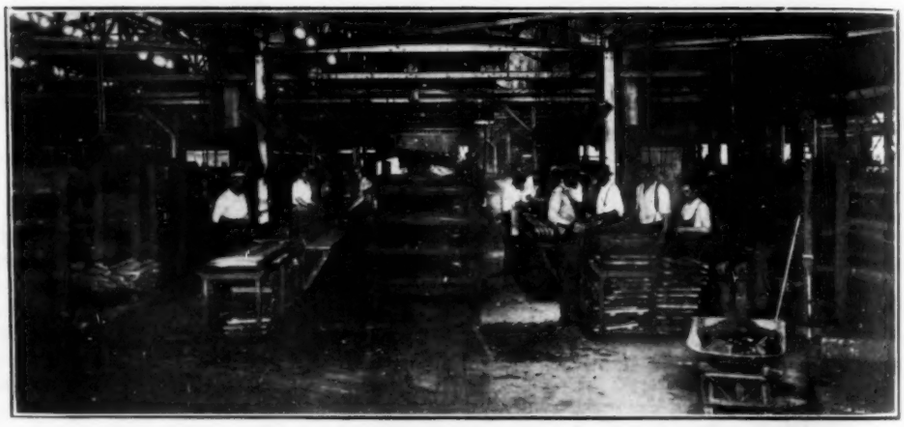
The construction of the plant is in itself unique. Its offices and buildings are completely decorated with aluminum wherever it has been possible to use the metal in place of some other metal or material. There are aluminum stairs, stair-rails, electric fans, furniture, window sashes and sills, signs, hardware. Aluminum has been used even in the inner parts of locks, except for springs, for electrical fixtures, and for the heavy fence around the factory. Wherever aluminum paint could be applied without detriment to appearance, it has been used.

The plant itself is well lighted, spacious and excellently laid out. Its 38 by 80 foot pattern vault adjoins the office. It is fireproof and its temperature is under constant control. Next to it is the carpentry and maintenance building, where flasks and other equipment are built and kept in condition. A power house is operated where steam is generated for heating the plant and for such operations as artificial aging of aluminum; the plant's blowers, compressors and pumping machinery are also kept in the power house.

The main foundry departments are in a series of rooms of very large size. There is the main melting room, 190 feet long, 70 feet wide and 33 feet high. It contains a large number of melting furnaces which are heated by oil burners. Each furnace is controlled by a pyrometer which registers in a central control station overlooking the room. When the melt in a given furnace is ready for removal to the pouring department, a whistle is blown and the furnace number appears on a large board, visible

X-Ray Room. A Large Motor Casting Is Being Photographed for Flaws

This Melting Room Is 70 by 190 Feet in Area. Its Big Batteries of Oil-Fired Furnaces Are All Scientifically Controlled from a Central Station by Means of Electrical Apparatus Connected to Each Furnace.



The Core Room Is Adjacent to the Bench and Floor Foundries. A Battery of Core Ovens Is Located Here, as well as Large Holding Furnaces for Metal to Be Poured in Intricate Dry Sand Molds.

to all the furnace operators. Two men are constantly employed checking the furnace temperatures, time, etc. The pyrometric control is continued as the metal is carried to holding furnaces on the pouring floors. As a ladle of metal is being trundled from the melting room, the temperature is checked again.

Next to the melting room are the bench and floor molding departments, housed in two rooms, one 60 by 150,

Bench Foundry Molding Room. Note the Neat, Clean Appearance.

the other 95 by 250 feet in area. Molding machinery and molding benches are used extensively, with many devices for sand preparation and for the carrying of molds. There are seven one-ton cranes and one three- and one five-ton crane. In the bench molding division there are low concrete walls against which the benches are placed. Similar walls separate the benches and their sand piles. Pyrometers are conveniently placed so that temperature control can be continued during pouring operations. Technical assistants are constantly on duty to supervise temperatures and pouring rates, which play a great part in making aluminum castings. Electric trucks are used extensively for carrying sand, castings, scrap, etc. Sand is delivered directly to the molding rooms by cars on the company's private rail siding.

The core room is placed adjacent to the molding rooms. It is equipped with coremaking machinery and a battery of seven oil-fired, two-rack core ovens and a smaller tray oven. More ovens are being installed. Some castings of very intricate design are poured in dry sand molds in the core room. Metal is kept in the core room in holding furnaces heated by electricity.

Proceeding along the "straight line" production path which is maintained throughout the plant, the knockout

Inspection Room. All Castings Undergo Careful Scrutiny Before Leaving the Plant.

room is next to the core room. Here the core sand, wires, pins, etc., are removed from the cores, and the castings are taken to the cleaning room adjacent. Cleaning is done with standard equipment and also with rotary files which cut down the castings before they are finally sand blasted.

Extremely Accurate Heat Treating Furnaces Are Used for Castings Requiring Utmost Care in Production. The Doors of the Quenching Bath Are Seen on the Floor in Left Foreground.

An inspection room 100 by 80 feet is next in line. This room is exceptionally well lighted and contains a variety of apparatus such as water pressure equipment, calipering tables and instruments for making various measurements. Thicknesses, as well as outside dimensions, are very carefully ascertained here with gauges especially designed for the work. This plant does a great deal of work for aviation purposes, especially for airplane motors, requiring highest standards of accuracy.

From the inspection room to the heat treating room the castings to be treated are carried by a monorail conveyor. Electric heat treating furnaces are operated. One such furnace is in operation now and another, to measure 12 feet long, 6 feet wide and 6 feet high will soon be in operation. The furnaces are automatically controlled but their temperatures are constantly watched by technicians in a control room containing adequate instruments. A quenching tank is set in the floor, with covers which raise by electricity.

Final inspection is given to castings after heat treating. This is done in the regular inspection room, from which the castings are carried to the shipping room next door for packing and shipping.

The company has an elaborate X-ray and photomicrographic department where constantly castings are examined and photographed for defects invisible to the eye. Chemical analysis of metals, sands, etc., and physical tests are carried out continuously. Test bars are cast with all important castings and these are taken to the physical laboratory for strength, hardness and other tests.

Considerable attention has been given to such matters as employees' washrooms and dressing rooms. Well-lighted, clean locker rooms are provided and, according to officials, these have had a material effect on the attitude of the workers to the company and their work.

Furnaces for Reduction of Drosses

Q.—I need a furnace for the treatment of battery plates, lead, solder and type metal drosses. What type of furnace do I require? The quantities of raw materials available here would be approximately 6 tons per week. Would the same furnace be suitable for all of the above drosses? What fluxes should be used, if any, in reducing these drosses?

A.—For a detailed reply to your inquiry we cannot do better than refer you to a series of articles by Edmund R. Thews, which appeared in THE METAL INDUSTRY in 1928, Vol. 26, pp. 394, 472 and 513. These articles refer particularly to the recovery of solder and babbitt metal from waste materials but in principle apply as well to type metal and battery lead.

Most work of this character is carried out in a pot type of furnace, using a steel or cast iron pot supported in a suitable fire chamber of brickwork. If cast iron is used for the pot its composition should be approximately:

Graphitic carbon	2.5%
Combined carbon	0.5 to 0.8%
Silicon	2.0%
Manganese	1.5 to 2.5%

The furnace should be so designed as to circulate the combustion gases around the pot as thoroughly as possible without exposing the latter to direct action of a hot flame. Forced draught should not be employed.

The nature of the refining process and the fluxes to be used vary widely according to the impurities to be removed. In order to remove copper the scrap material should be melted and then allowed to cool. During cooling a dark heavy dross containing most of the copper floats to the surface and can be skimmed off, using a perforated ladle which permits the fluid white metal to drain out of the dross. If a considerable amount of copper is to be removed this process should be repeated. If necessary, the final residue of copper down to a very low percentage may be removed by treating the hot molten metal with stick sulphur submerged beneath its surface. The resulting copper sulphide floats and should be removed by skimming.

Zinc may be removed from the molten bath by passing steam through it, in which case great care must be taken to prevent steam from condensing in the line and reaching the metal bath in the form of liquid water, since this would cause an explosion. A flux containing sal ammoniac is also fairly effective for the removal of zinc. Arsenic may be reduced in amount by rabbling the white metal with iron, maintaining the bath at a high temperature during this operation.

If it is merely desired to treat type metal drosses to recover as much as possible of the metal free from dross and dissolved oxides, the molten metal should be "poled" with green wood and the dross skimmed off with a perforated ladle. Powered resin may be used as a covering flux to protect the metal from further oxidation during this process.

—H. M. ST. JOHN.

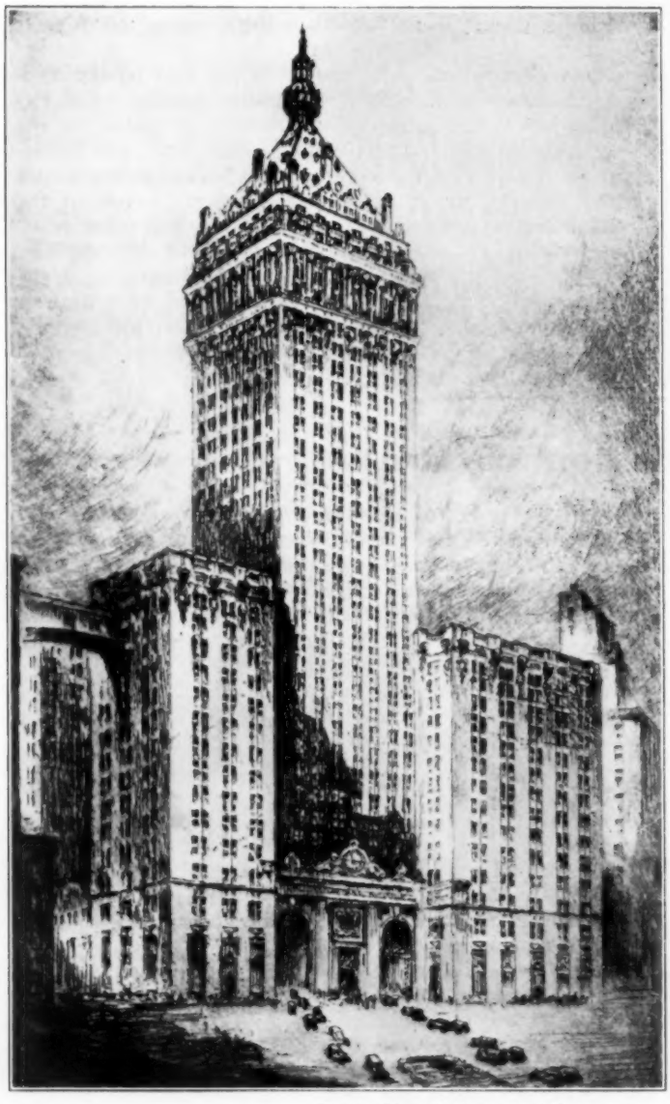
Metals in Modern Skyscraper Construction

Non-Ferrous Materials Help to Make Great Structures Safe, Efficient, Enduring and Beautiful—Aids in Feeding Many Workers

THE general conception of the materials used in construction of the skyscraper of New York—and of many other cities which are in increasing numbers vieing with the eastern metropolis in reaching for the heavens—is concerned with bricks, mortar, steel and stone. An inspection of any of the hundreds of new buildings that have sprung up in New York City during the past few years, however, will reveal that to these materials must be added a great number of others, among which the non-ferrous metals—copper, lead, zinc, nickel, tin and a great many alloys—play a highly important and practically indispensable part. Aside from the widely known facts that electricity, telephone and telegraph apparatus and similar equipment could not function without copper and its alloys, there are many interesting but less obvious and hence less widely known uses for the non-ferrous metals and metallic finishes in the construction and decoration of the modern cathedrals of commerce.

The consumption of metals, without figuring in the iron and steel, for a building of thirty or forty floors is enormous. One of the most striking examples of the latest uses of metals in the erection of skyscrapers is to be found in the New York Central Building, Forty-fifth and Forty-sixth Streets and Park Avenue, New York City. Hundreds of tons of copper, bronze, brass and even large quantities of gold have been fabricated into hundreds of different forms to give the building its thirty-six story skeleton together with its numerous external adornments and refinements.

If the steel, the brickwork and the mortar were to be stripped from the brand new walls there would stand revealed an intricate net-work of brass piping, 100 tons and more, used in the non-rusting water system which supplies every office in the building.



Photo, New York Central Lines

The New Building of the New York Central, Park Avenue, New York City. The Dome Is Entirely Coated with Gold Leaf

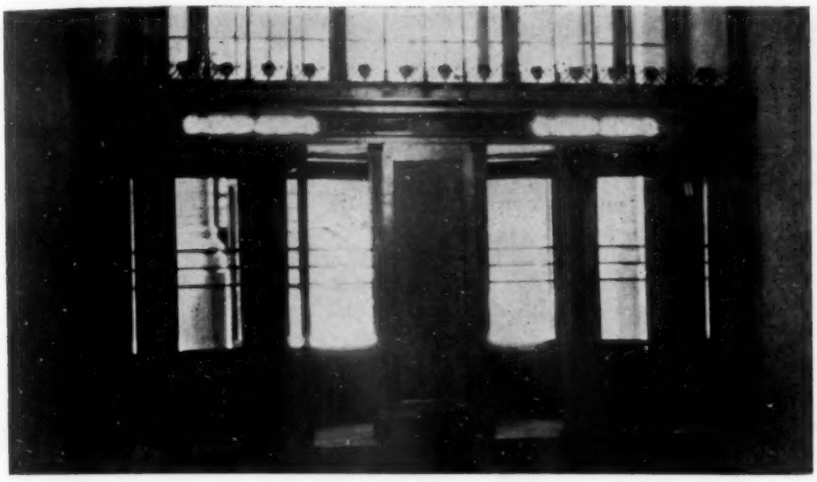
Photo, New York Central Lines

One of the Many Cast Bronze Exterior Decorations on the New York Central Building

Sidewalk canopies; a huge, beautiful ornamental clock with supporting statuary which will face up Park Avenue; copings; artistic doors of massive construction; window casements; and a host of decorative gargoyles and nymphs, symbolic figures of transportation allegories, consumed approximately 100 tons of enduring bronze.

Copper, too, is used to a great extent, some 300,000 pounds to be exact, particularly in the tower, with its splendid lantern which is a thing of beauty at night, and in the flashings and roofs of the building set-backs and dormers.

Gold, many, many dollars worth of it, in leaf form, has been applied to the tower by a crew of gilders who swarmed over its surface to reach almost inaccessible spots. Aside from its adornment value, which is materially enhanced at night by a unique lighting system, gold is a weather resistor that will never tarnish or fade

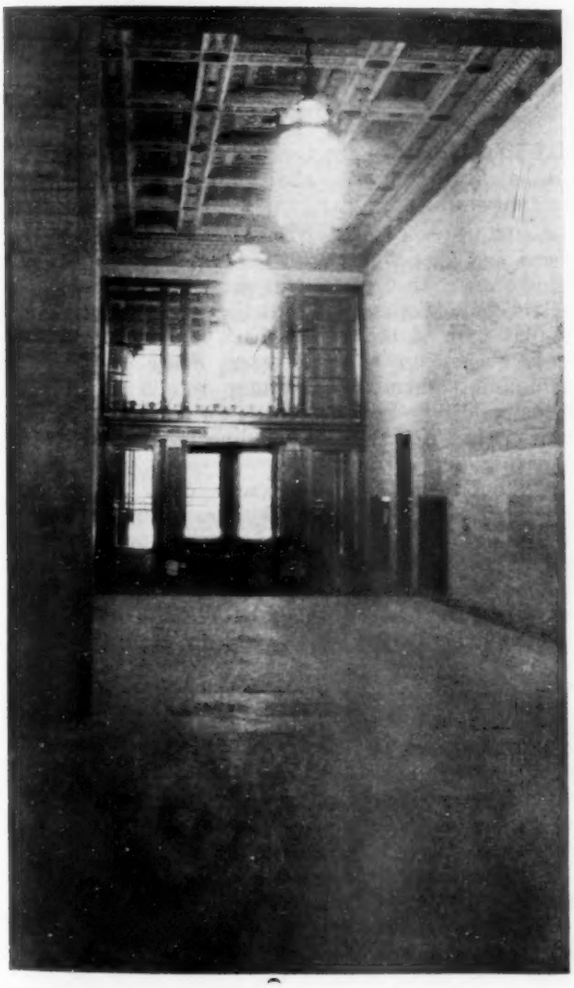


Main Entrance of the New York Life Building at Madison Square, New York City, Seen from Inside the Main Corridor. A Great Deal of Bronze Work Is to Be Seen on This and Other Entrances.

under the attacks of murky atmosphere and storm.

Miles of plumbing, hundreds of radiators carefully concealed in the latest of skyscraper modes, elevators, copper wires in the telephones and annunciator systems, ventilating grills and an unbelievable variety of smaller items contribute to the metal tonnage of the new building which recently rose from a hole in the ground sixty-two feet below the street level and through two levels of railroad tracks to the tip of the tower thirty-nine stories from the foundation of bed rock.

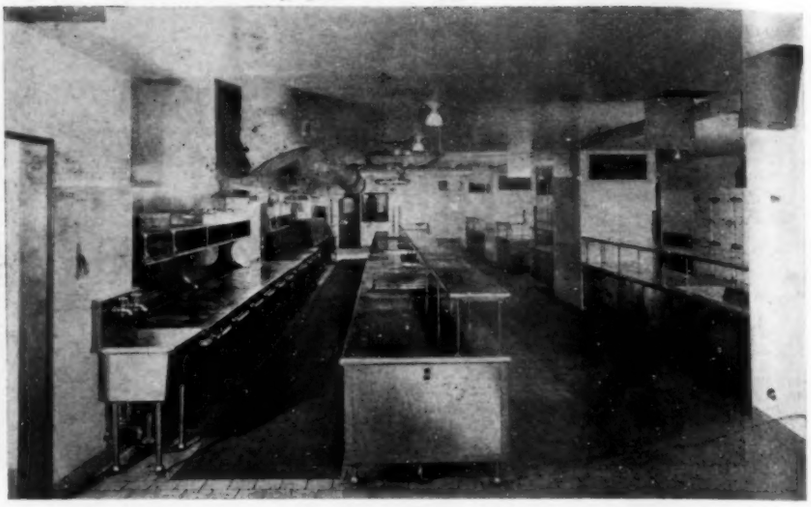
With more than fifty-four million pounds of metal (including iron and steel) fabricated into it, there can be little doubt that the New York Central Building will endure for decades to come, solid and fireproof throughout, a monument to the latest in modern building achievements.



Very Much Cast and Worked Metal Went into Doors, Elevators, Mail Boxes and Other Useful as well as Decorative Parts of the New York Life Building. At Left Above Is Shown One of the Transverse Corridors. At Right, a Massive Bronze Mail Box and two Bronze and Glass Mail Chutes which Run to the Top of the Building.

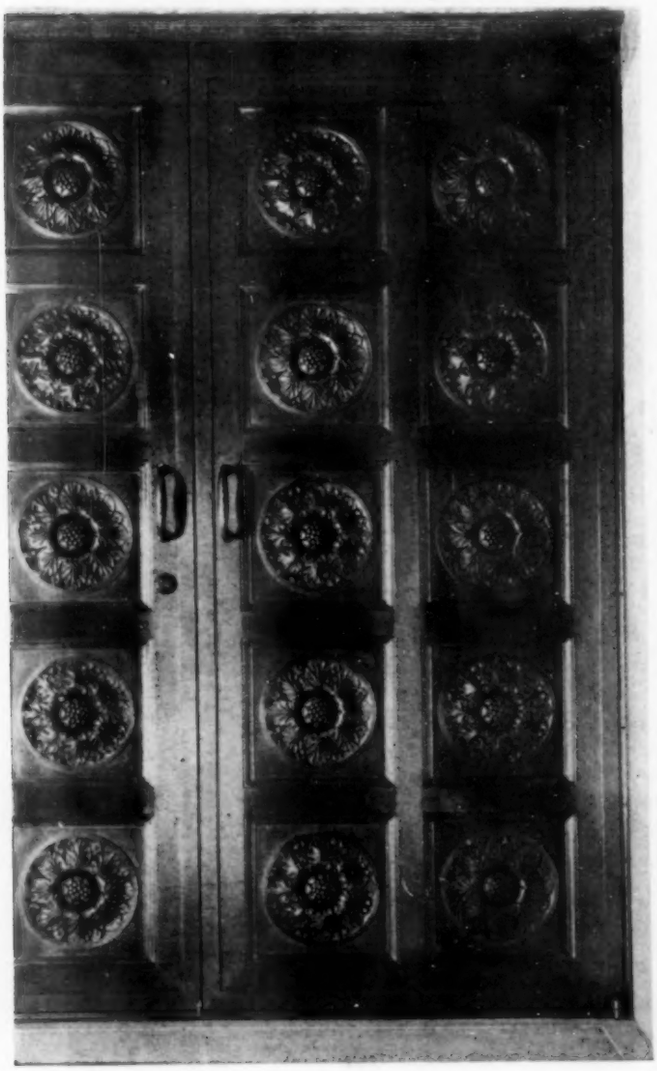
The new edifice of the New York Life Insurance Company at Madison Square, New York City, built upon the site of the historic old Madison Square Garden, is another example of most modern construction where the non-ferrous metals have played an important role in making the building more enduring, safer and extremely beautiful.

This building has in its mechanical equipment and decorative effects many hundred tons of brass and bronze. The brass used in construction was furnished largely by the W. G. Cornell Company, New York City, plumbing and heating contractors, and Baker, Smith and Company, New York City, heating and ventilating contractors. The brass, of course, was mainly in the form of pipe and fitttings, special castings, wire, etc. Then there was the large amount of electrical apparatus, requiring miles of copper wire and the use of copper in many other forms.



A Corner of the Main Kitchen, New York Life Building

Copper roofing and other sheet metal work was supplied by Benjamin Reisner, Inc., another New York firm.



Great Bronze Doors Ornament the Stairways from the Main Corridor of the New York Life Building. There Are Eight Pairs Such as These.

The tower roof is gilded, the gold having been applied by Mack, Jenney and Tyler, New York City, decorators. The Art Metal Construction Company supplied miscellaneous metal work, The Peelle Company installed certain of the doors, and aluminum was furnished by Fischback and Moore, Inc., New York City.

Some of the great bronze works installed in the building, such as the doors, windows, gates, lanterns, including the great lantern on the roof, were manufactured by the John Polachek Bronze and Iron Works of Brooklyn, N. Y. (now part of the General Bronze Company). The Cornell firm mentioned above furnished tin and lead for the building, as well as brass.

A unique use of non-ferrous metals in this building is in nickel and Monel metal kitchen equipment. It is unique not because the equipment has been made of these metals but because kitchens have been installed as a regular part of the building. The New York Life Insurance Company feeds a great many of its employes, maintaining kitchens and dining rooms in the basement of the building. For this reason the company had to figure into its plans for the new building the requisite items for preparing and serving food.

Nathan Straus and Company (W. J. Buzzini), of New York City, were called upon to furnish the nickel and Monel metal, a great deal of which went into utensils as well as such equipment as steam tables, sinks, ovens and stoves and other paraphernalia. Certain bronze and nickel features were installed by William H. Jackson and Company, Brooklyn, N. Y. Hardware of a great many varieties including brass and bronze was supplied by the Yale and Towne Manufacturing Company.

The building has, of course, a great many electric lighting fixtures, most of which are made of cast and rolled brass and bronze. In this work Edward F. Caldwell and Company figures. Mail chutes of glass and bronze were installed by the Cutler Mail Chute Company. Metal and glass directional signs which adorn the halls of the building while making them easier to use were installed by the Frink Company.

Certain cast bronze tablets were executed by The Forman Company.

All these items indicate the extent to which the non-ferrous metals have figured in the construction of these great new buildings which house some of America's greatest business institutions.

Brass Test Model for Arch Bridge

THE Kill von Kull Bridge, now under construction, will connect Bayonne, New Jersey, with Port Richmond, Staten Island, New York. The waterway will be bridged from shore to shore by a single arch with a span of 1,675 feet between centers of bearings.

The two arch trusses are in vertical planes, 74 feet apart on centers. Their depth between centers of chords increases from 37.5 feet at mid-span to 67.5 feet at the abutments. Both upper and lower chords form true parabolas. The center line of the lower chord rises at mid-span 274 feet above the center of bearings.

Brass Bridge Model Standing in Testing Apparatus

Bridges are designed and proportioned on the basis of mathematical studies and the knowledge of the elastic behavior of the structural materials used in the bridge. Years of experience and occasional tests of structures have shown the sufficiency of the methods and procedure commonly used in the designing of bridges. When a structure of unusual and untried dimensions is planned, it is desirable, however, to make such additional studies and experiments, as may give further information of its behavior under the action of forces.

The purpose of making a model for the Kill von Kull arch was to obtain as far as possible, a physical check of the results derived from theoretical investigations, mainly for the lateral distortions of the structure and the effect of the sway bracing on the vertical deflections. The model is now on exhibition at the Museums of the Peaceful Arts, 24 West 40th Street, New York City, by whose courtesy the accompanying photograph is reproduced.

A brass model was constructed which is a proportional replica of the arch to be built and is sensitive enough to permit observation by means of instruments of high perjection, of strains and distortions under proportioned loads placed on it. A length of about 9 feet was chosen as convenient for the model of the Kill von Kull Bridge. To simplify the construction and to reduce the proportioned loads a softer material than steel was chosen. Brass was adopted because of its relatively low elastic modulus and its uniformity. The equivalent resistance of the members and practical limitations resulted in an actual reduction of areas of 1 to 6,000. Considering, however, the moduli of elasticity of the two materials, steel and brass, the model is but twice as still as the full sized structure.

Each vertical truss plane was cut out of two plates and brazed together at the center. The two vertical trusses then were braced together by the lateral members and the portals by soldering.

A complete mathematical analysis has been made of the model. This analysis is based on the same assumptions as those used in the design of the full sized structure. A physical study has been made of the model by observing and measuring distortion and strains under various loads applied to it. A comparison of the results of the two independent investigations leads to a full understanding of the expected behavior of the arch to be built over the Kill von Kull.

Improvements in or Relating to Electrodes for Electric Welding or Soldering

ACCORDING to a recent British invention, a quantity of sawdust is included in the coating of electric welding electrodes. The ingredients of the coating, it is stated, depend upon the nature of the core metal of the electrode and the purpose for which the electrode is to be used, and the nature and the proportions of the ingredients can be varied considerably. For electrodes for use in the welding of iron and steel, a suitable coating composition can, for example, be prepared from the following ingredients: Felspar, 1 part; fluorspar, 1 part; calcium carbonate, 1 part; sawdust, 1 part; and sodium silicate solution, 40 deg. Twaddle, 1 part.

For electrodes for use in the welding of copper, brass and bronze the ingredients for a suitable coating coposition may comprise, for example: Fluorspar, 3 parts; alkaline silica glass, 4 parts; sawdust, 4 parts; chalk, 3 parts; and sodium silicate solution, 40 deg. Twaddle, 5 parts. The various solid ingredients of the coating are first ground together to a fine powder and then made into a smooth paste by the addition of the sodium silicate solution. If desired, however, the sodium silicate can be omitted and the paste made by the addition of water alone to the powder, or, for a harder setting mixture than that obtained with water alone, water may be used with some dextrine or other agglutinant. The paste is applied to the metal core in any convenient way and then dried.

With electrodes made in accordance with the invention, a reducing atmosphere is created around the arc so that the metal can be deposited without coming into contact with any free oxygen or oxygenerating compound. [No. 301,221. Alloy Welding Processes Ltd.; and Edward John Clarke, both of 14-16 Cockspur Street, Charing Cross, London, England.]

—A. EYLES.

White Metals, Brasses and Bronzes

A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant—Part 1

By E. PERRY
Consulting Chemist, Oakland, Cal.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Bearing Metals

THE base of the white bearing metals designed for anti-frictional purposes is an alloy composed of tin, lead, antimony and copper. Occasionally there is introduced for certain purposes a small amount of aluminum, bismuth, arsenic, zinc, mercury, iron, nickel, and phosphorus. These latter elements influence the melting point, fluidity, hardness, ductility, etc. The anti-frictional properties of a bearing metal are obtained with lead and antimony; the ductility or toughness with tin; and the strength and hardness with copper.

Some of the metals used in the anti-friction alloys have a low melting point, others a comparatively high melting point. Theoretically, an alloy made with two such metals should have a melting point midway between that of the two constituent metals, but such is not the case as an alloy composed of two metals usually has a lower melting point than the average of the two, while one composed of three or more metals (manganese, iron, and nickel excepted) generally melts at a lower temperature than the theoretical average melting point of all the component parts. An "eutectic" mixture is one in which the proportions of the different metals used is such that a minimum melting point is obtained.

In melting the anti-friction alloys it will be noticed that the metal passes through three different stages during the process of fusion. At the point where fusion begins the metal becomes "mushy" or granular, due to the breaking up of the crystalline alloy, the expansion by heat forcing the crystals apart. At a slightly higher temperature the metal becomes liquid, remaining so until a critical high temperature is reached, at which point the molten metal begins to move and is said to be "alive." The actual boiling point and the temperature at which the metal begins to vaporize is considerably above that of the three stages of fusion and is seldom reached in the ordinary practice of melting the anti-friction alloys.

In cooling, the metal passes back through the same stages but the congealing point is usually 20 to 40 degrees lower than the initial melting point. Nearly all of the metals while in fusion, especially at a high temperature, oxidize in contact with the air, a sort of scum (dross) forming on the surface of the molten metal. By excluding the air the oxidation is prevented and the loss is reduced to a minimum. Some metals have a great affinity for each other and when melted, mix perfectly, while others seem to be repellent to each other and separate out in segregated masses on solidifying, the heavier metal being inclined to settle to the bottom of the alloy.

Defects and Their Causes

Bearing metals are subject to the following defects in service, viz:—(a) boxes becoming hot and melting out; (b) crushing of the bearings under heavy pressure; (c) cracking or breaking, due to pounding; and (d) metal "flowing" or carrying over and filling the oil grooves. All of these defects generally occur in the field (in the case of machinery or equipment for outside usage) and the cost of repairing the damage is ten-fold more than in the shop. Three-fourths of these defects may be traced to poorly-made bearings, i.e.—the alloy not properly melted and poured, while the remaining one-fourth can be laid to faulty chemical composition of the alloy.

(a) Hot box and melting out of the alloy is caused by insufficient lubrication or a poor grade of oil, and by sand, dirt, etc. in the bearings. Melting out cannot be laid to the composition, as the melting point of the high and low grade bearing metals is nearly the same. The melting point of Genuine Babbitt with 89 per cent of tin is 451° F., while that of No. 4 Babbitt containing 13 per cent of antimony and no tin is 450° F.; in fact, the melting point of all the white bearing metals is between 350° and 490° F.

(b) Crushing of the bearings under heavy pressure is due to the metal being too soft to resist the compression, meaning that the composition is not right.

(c) Cracking and breaking of the bearings under impact or pounding may result from two causes—either the alloy is too brittle, or the bearings poured too cold. In the former case brittleness may be due to oxides contained in the alloy, or to an excess of antimony or copper, all of which induce brittleness. On the other hand, if the metal is poured too cold the casting or bearing will usually be full of seams, waves, flakes, and blow holes.

(d) The "flowing" of metal usually occurs when either a high tin or lead alloy deficient in antimony or copper is subjected to a high speed under a heavy pressure. This defect may be partially overcome by using a small quantity of flake graphite in the oil.

Pouring Babbitt

As previously stated, all of the regular Babbitt metals and white bearing-alloys have a relatively low melting point, ranging from 350° to 490° F. In order to get a perfect casting or bearing free from cold-shuts, seams, etc., it is essential that the molten metal be thinly fluid, and this condition can only be obtained at a relatively high temperature, many degrees above the normal melting point. The fear of burning the Babbitt often prevents the metal from being poured hot enough. This fear is quite natural, for at a high temperature all of the metals oxidize quickly in contact with the air, and the dross which forms on the surface of the hot alloy is mistaken for "burnt" metal. By excluding the air it is possible to melt and heat

the bearing alloys composed of lead, antimony, tin and copper to 1600° F. without fear of burning, as the lowest burning point—that of antimony—is 1652° F. The proper pouring temperature of Babbitt metal is just double that of its melting point; for instance, an alloy with a melting point of 450° F. should be poured at a temperature of 900° F. Metal poured at any temperature between 800° and 1200° F. usually gives good sound bearings, and metal at 1200° F. poured into a cold mold produces a closer-grained alloy than one at 800° F. poured into a hot mold, because the sudden chill prevents segregation. Slow cooling favors segregation, and in such cases the different metals separate out; the lead, on account of its density, usually settling to the bottom of the alloy. In the field, the pouring temperature is generally determined by plunging a pine stick into the molten metal, the charring and inflaming of the wood indicating the proper heat. Dry pine wood with its natural content of moisture chars at about 700° F. and ignites at 800° to 1000° F.

It is considered necessary in field work to heat the metal very hot as it must be poured against a cold surface; therefore, field babbitting in most cases is better than that done in the shop where a hot mold and dull poured metal are the rule. Water chilled molds are used in all of the large die-casting shops and type foundries, the object being to prevent segregation and to get sharp impressions. All molds must be well vented, otherwise they will not fill properly; and furthermore, the opening for pouring the metal into the mold must be large enough to prevent spattering, as it is essential that the metal be poured steadily. Intermittent pouring produces cold-shuts, waves, flakes, etc., and unless the metal is fed in until it sets there is sure to be formed a large shrinkage cavity. In melting alloys of any kind it will be noticed that a scum or dross soon forms on the surface of the molten metal, especially at a high temperature; this is due to the oxygen in the air, which combines with the surface metal and converts it into oxide. Tin and zinc produce white-color oxides; lead gives a yellowish-gray oxide; antimony a dark gray; and copper a black oxide. If phosphorus be present, all of the impurities and the oxides will unite and form a black scum on the surface of the melt. This black dross is distinguished from all other oxides by having a "greasy" appearance, by forming in clots, and by attacking the iron of the kettle and ladle. On cooling, this scum or dross sets to a glass-like cement characteristic of the phosphide minerals. By keeping the air from the surface of the molten metal there will not be this formation of oxide, but in the presence of phosphorus or other de-oxidizing agents more or less dross will come to the top and must be skimmed off.

Tinning the Box

Babbitt metal (also tin and lead) do not adhere to cast iron bearing boxes unless they have been previously tinned. Grease and rust interfere seriously with the tinning of iron and steel and must be removed with solvent, caustic soda, and emery cloth, then the iron or steel given a wash with "soldering fluid" previous to tinning. The proper composition free from iron and other impurities is essential, and the following formulæ are recommended:

Into an earthenware jar standing out of doors place 3 pounds of scrap zinc, preferably sheet zinc cut into small pieces. Make a mixture consisting of 1 gallon of strong hydrochloric (muriatic) acid and 1 gallon of soft water; pour this mixture onto the zinc in the jar and allow to stand until the violent reaction ceases. The effervescence is due to the evolution of hydrogen gas which is inflammable. Solution may be hastened by occasionally stirring the mixture, and in about 24 hours it will be found that most of the zinc has dissolved. Then should be added to this about 2 ounces of dry zinc oxide and after being well stirred the solution should be left undisturbed about two days by which time all of the iron and impurities will have settled to the bottom in the form of a black or rust-colored precipitate. The clear supernatant liquid is now to be poured into a clean jar, being careful to not stir up the sediment. Finally, to this clear solution should be added 4 ounces of powdered sal-ammoniac (ammonium chloride).

The above makes a neutral soldering fluid suitable for brass, tin, etc., but for steel and iron it is recommended to add 1 quart of strong hydrochloric acid. For tinning cold cast iron, dissolve 1 ounce of blue vitriol (copper sulphate) in 8 fluid ounces of water, then add 8 fluid ounces of the acid soldering fluid last mentioned as for iron and steel. This solution brushed over bright cast iron or steel leaves a coating of metallic copper to which tin or solder adheres quite readily. If a soldering copper is used for tinning, it must be red-hot otherwise the tin will chill before it can be spread over the surface. The tinning should be done as soon as the iron is coated with copper; in fact the tinning may be done while the copper solution is still wet. After copper plating has become oxidized it will not take the tin so readily.

This series will be continued in an early issue.—Ed.

When Aluminum Is Better Than Steel

IT will perhaps be remembered that during the war several million bullet-proof helmets were made of managanese steel. These helmets were, of course, designed for use in actual warfare, when the protection they afforded was more important than their comfort as head gear. (Though light in weight, considering the protection they afforded, they were distinctly on the heavy side.)

Recently, Edgar Allen and Company, Ltd., Sheffield, England, were asked whether they could supply a similar helmet, but made in aluminum, that could be used on ceremonial occasions as a substitute for the heavy steel helmet. The inquiry was made on behalf of Prince Henry, who found the weight of his steel helmet oppressive when reviewing the troops made it necessary for him to wear it.

The above mentioned firm were glad to have this opportunity of obliging a member of the British royal family, and accordingly supplied an aluminum helmet which gave great satisfaction to His Royal Highness. Since then, the advantage of this light helmet has been widely recognized and many staff officers, generals and other military officers, are now purchasing them. —A. Eyles.

All-Metal Dirigible Makes Successful Flight

THE substitution of metal for the heretofore customary fabric covering for airships of the dirigible type drew definitely nearer with the flight on August 20, 1929, of the first metal-clad dirigible balloon, an experimental craft built by the Aircraft Development Company, Detroit, Mich. The initial flight took place at Detroit under the supervision of United States Navy officers who flew the ship before removing it to the navy hangars at Lakehurst, N. J. It was built for the navy upon condition that it

International Newsreel Photo

The ZMC-2 Leaving the Ground at Detroit in Test Flight

substantiated claims made for it prior to construction. These claims have been fully sustained by the test flights and the manufacturers are preparing to erect a much larger craft of the same type.

The dirigible, known as the ZMC-2, is shaped like a blimp. It is 150 feet long and 50 feet in diameter at the widest point. Its covering is produced of a newly developed aluminum alloy known as Alclad, which is somewhat similar to Duralumin but has greater corrosion resistance than the latter. The metal was rolled to a thickness of only 95 ten-thousandths inch but is said to be capable of supporting the weight of a man without warping. It was joined to form the covering of the ship by special sewing machines using wire instead of thread. Its framework vaguely resembles the backbone of a fish, being formed of twelve circular frames placed in triangular fashion. The frame is stiffened by wires placed diametrically across the interior of the hull. Its shape, according to engineers, is more efficient than that of dirigibles built in the past, which are relatively slimmer and longer.

The construction of the ship was accomplished only after a great deal of original work in design had been done by the engineers in charge. New machinery had to be designed and new production methods devised to meet the entirely new principles upon which the airship has been constructed.

The rudder of the ordinary dirigible has been supplanted in the ZMC-2 by eight fins placed around the hull of the ship, toward but not at the rear. It is propelled by two Wright Whirlwind motors of 200 horsepower each, which are placed on each side of the corrugated Duralumin cabin, which is well streamlined. The ship develops a speed of 60 miles per hour. It cost $750,000 to build and took the best part of five years, a good deal of which was taken up in research and development before actual building was undertaken.

The craft was built purely experimentally, according to the builders, and would not be suitable for trans-Atlantic flights. However, it was stated that it might be very well suited to carrying of passengers and freight to Bermuda or Hawaii. The ship now to be built will be from twelve to fifteen times as large as the ZMC-2, it was stated, with 2,500,000 cubic foot capacity instead of the 200,000 cubic feet in the present ship. The larger craft would be capable of developing 100 miles per hour and would be suitable for trans-oceanic flights. The opinion was expressed the metal would supplant fabric for dirigible covering, just as it has to a large extent taken the place of other materials in the airplane.

Machining Aluminum Castings

Q.—Can you furnish us with information in regard to machining aluminum castings? We are having trouble in the machining of this metal, using same tools and speeds used for brass.

A.—Tools for machining aluminum castings, turning, drilling, milling and planing should have acute cutting angles as compared to brass cutting tools.

After rough grinding the tool, it is advisable to finish the cutting edges with an oil stone for fine work as a keen smooth edge is very essential. High speeds and light cuts are recommended. For drilling, a straight fluted drill gives the best results. If twist drills are used the cutting edges should be ground without front rake.

The principal difficulty in machining aluminum alloys is caused by the clogging of chips which become so wedged between the teeth of milling cutters, counterbores and similar tools that they cannot be removed with a brush.

This difficulty can be largely overcome by the use of a cutting lubricant. Soap water and kerosene are commonly employed. The latter enables a fine finish to be obtained provided the cutting tool is ground properly. For milling flat surfaces it is preferable to use end mills rather than cylindrical cutters. The cutting edges or corners of cutters should be sharp instead of rounded. The depth and width of cut are of minor importance. A cutting speed of 325 feet per minute is practicable and from 2½ to 4 cubic inches can be removed per minute. As regards the cutting speed as well as the feed in machining aluminum, these can be governed by the size or diameter of work or done at the same speed as used for brass.

—P. W. Blair.

Bright Tinning

Q.—I would like to have some information on hot tinning. I am having trouble with my tinned parts which are mostly hot rolled steel and some cold rolled steel. They do not stay bright after tinning. Please advise what is necessary and how to do bright tinning.

A.—If your only trouble is that the steel part will not stay bright it is necessary to use pure tin. This is necessary when the requirements are that the article shall stay bright. So we assume you are using pure tin.

We suggest running the tinned article through oil. Kerosene oil is used for this purpose. There is no danger unless you apply a spark of some kind.

Another method of obtaining a very bright article is to add 10% bismuth to the tin. This produces a very bright coating, but cannot be used safely in cooking vessels, however. Adding 10% bismuth is not nearly so expensive as you would think, as tin will dross much less.

—W. J. Reardon.

Electric Heat Treatment for Aluminum

Heat Treating Aluminum Alloy Castings in a Cylindrical Pit Type Electric Furnace

By N. B. JONES
Industrial Heating Engineering Department, General Electric Company, Schenectady, N. Y.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

ALTHOUGH the tensile strength of an aluminum casting made in a permanent mold will be 3,000 to 5,000 pounds per square inch greater than for an identical sand casting, this may be further increased (providing the alloy is of proper analysis) by heat treating. In fact, heat treating will usually improve all the physical properties except the modulus as is shown by the following data reproduced in part from a publication of the Bureau of Standards.

	AS CAST	HEAT TREATED
Tensile strength (2"x½") lbs. per sq. in...	21,500	31,000
Elongation in 2", per cent.....	2.2	5
Compression strength, lbs. per. sq. in.....	35,000	44,000
Torsion, ultimate, lbs. per sq. in.....	19,500	23,500–29,500
Torsion, modulus of rigidity.....	4,700	4,700
Brinnell 500 Kg. 10-mm. ball.....	58	77

These are average values for sand cast unmachined samples, analysis—4.3 to 4.9% Cu., 0.8% Si., 0.6% Fe., .03% Mn. The heat treatment consisted in heating to 510 degrees C (950 deg. F.) 24 hours, quenched in boiling water and aged at 100 to 150 degrees C. (212 to 300 deg. F.) for two hours.

Briefly the theory for the hardening of an aluminum alloy of this type is that if, for example, an alloy containing about 4% copper is heated to about 540 degrees C. (1000 deg. F.), all the copper with go into solid solution in the aluminum as $CuAl_2$. When quenched from this temperature the material cools without immediate precipitation of $CuAl_2$, from the solid solution. However, if the metal is allowed to stand for a time at room temperature (this is true for duraluminum) or, reheated to a temperature in the neighborhood of 150 deg. C. (300 deg. F.), particles of $CuAl_2$ are precipitated and disseminate through the soft aluminum matrix. This not only hardens, but also strengthens the alloy. The fine particles of $CuAl_2$ distributed through the material is thought to "key" the material against slip and thus to increase the resistance to deformation.

With alloys of high copper content, up to about 5%, the temperature range between that necessary to bring about a complete solid solution of the $CuAl_2$ and of the liquidus is very narrow. Consequently, the design of a furnace for heat treating such alloys must be such that close temperature control may be secured, and that at no time during the heating cycle will the temperature exceed the liquidus value for the alloy being treated.

The electric furnace is used almost exclusively for this work. There has recently been put in operation a pit type furnace for heat treating aluminum which, although the units operate at a low watt density during the holding period, has a high power input during the heating up time and produces the required heating conditions with a high degree of accuracy, all this being accomplished with a minimum of separately controlled circuits and without the use of transformers. The design of this furnace is well worthy of consideration.

The working dimensions are 4 feet diameter and 6 feet deep; two 4 feet-by-3 feet baskets, containing the alloy castings of miscellaneous shapes, are accommodated in one charge. The furnace was designed to heat a charge of 500 lbs. of steel baskets and 1,500 lbs. of castings from 600 degrees to 950 degrees F. in one hour. The charge was to be held at this temperature for 12 hours and then quenched in water. An oven for preheating the work before placing the charge in the furnace and for aging after quenching completes the set-up.

Figure 1, a view looking down into the furnace, shows the heating units of nickel chromium resistor ribbon mounted on the sidewalls and on the bottom supported by molded refractory insulators. The connected load on high heat is 84 kilowatts, 220 volts, 3 phase. There are two separately controlled circuits, one comprising the top three tiers of windings rated 30 kilowatts, 220 volts, 3 phase, and the other circuit rated 54 kilowatts, 220 volts, 3 phase, which is made up of the remainder of the windings.

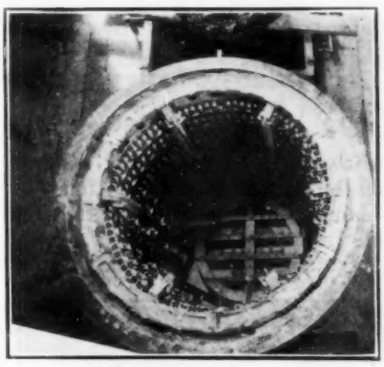


Fig. 1—Interior of Pit Type Electric Furnace for Heat Treating Aluminum Alloy Castings. Cover Has Been Removed to Give View of Inside

The control panel for each circuit is equipped with a switch which enables the operator to throw the units to low heat or 28 kilowatts for the holding period. This is accomplished by changing the top circuit from 220 volts, 3 phase, Y-connected to 220 volts, series-single phase, and by changing the lower circuit from 220 volts, 3 phase, delta-connected, to 220 volts, 3 phase, Y-connected. This method of reducing the power maintains the same relative distribution of heat for both conditions.

In a furnace for this work, the heat distribution is a very important factor that must be carefully considered. A check on the first charge that was run in this furnace showed the following temperatures in the charge for the 12-hour holding period: top, 955 deg. F., center, 960 deg. F., bottom, 955 deg. F. A second run at a higher temperature gave corresponding reading of 970 deg. F., 970 deg. F. and 965 deg. At different points readings taken at each side and in the center diametrically through the chamber showed a constant temperature through the charge in any one plane of plus or minus 1 deg. F. Part

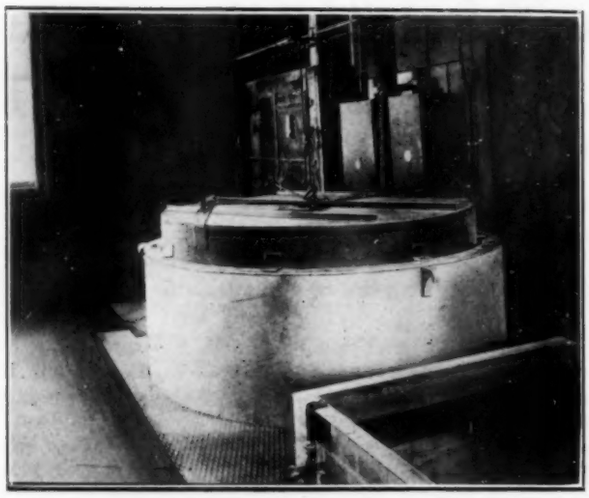


Fig. 2—Exterior View of Heat Treating Furnace for Aluminum Alloy Castings

of the credit for the excellent heat distribution must be accorded to the cover.

Fig 2 shows a view of the furnace with the cover closed. Fig 3, a cross section through the furnace, shows how the extended steel case of the cover forms a seal with the insulation. That this seal is highly effective may be seen by comparing temperature readings taken with the furnace empty and after the power had been off for 5½ hours.

LOCATION OF THERMOCOUPLE	TEMP. DEG. F. IN FURNACE AIR
Top	745
Just above center	748
Just below center	748
Bottom	745

A glance at Fig 4 showing a basket being lowered into the furnace discloses the fact that provision must be made for prevention of damage to the units and that the inner firebrick wall, unless capped in some manner, would soon suffer injury from accidental blows delivered by the basket. The heating units are protected by six equally spaced removable guides as shown in the illustrations. A six-segmented iron casting forms a cap over the top of the wall and in addition acts as supports for the top guide retainers.

The baskets are supported the proper distance above the bottom units by an I-beam hearth placed on firebrick piers. The hearth and all the other structural steel parts in the heating chamber are calorized to resist oxidation.

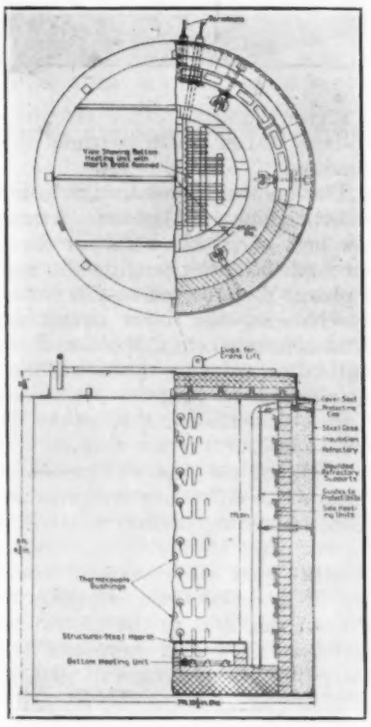


Fig. 3—Construction Details for Pit Type Electric Furnace for Aluminum Alloy Heat Treating

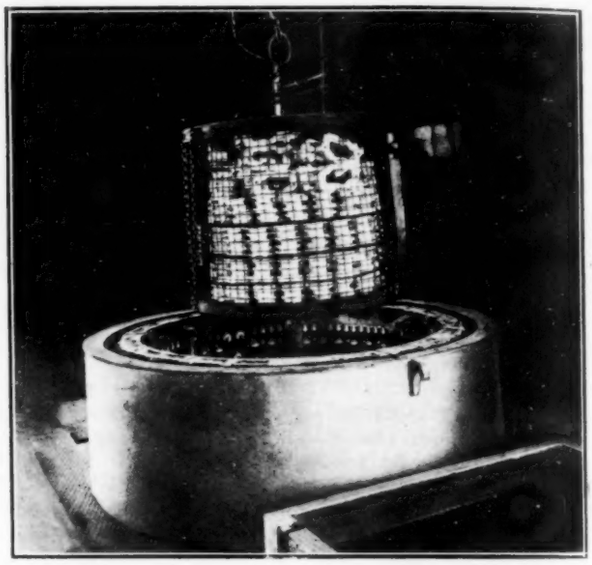


Fig. 4—A 500-Pound Charge in the Loading Basket Being Lowered Into the Heat Treating Furnace

It is not difficult to draw the conclusion that this furnace fulfills very exactly the requirements for heat treating aluminum. It is economical to operate; it provides quick heating time and at the same time controls the upper temperature limit; it has a uniform distribution of temperature throughout the heating chamber, and, as would be expected, it has the inherent characteristic of all electric furnaces:—accurate temperature control throughout the heating cycle.

Ingot Brass Flux

Q.—We would like to inquire as to how you can keep the sulphur and phosphorus contents in ingot brass down to the lowest possible minimum. We are manufacturing ingot brass from scrap metal in an oil burning rotary furnace.

A.—A good flux for such work, one we would suggest, is a mixture of 75 lbs. lime and 25 lbs. fluorspar.

The mixture of lime with the fluorspar produces a very elastic flux. By increasing or decreasing the amount of lime a slag of any degree of fluidity may be produced. The lime, too, has a very beneficial action on the metal and tends to remove sulphur.—W. J. Reardon.

Carbon Electrodeposition

Q.—We have the problem before us of producing a film of carbon on certain small pieces of lead. It has occurred to us that a very uniform coating of carbon could be put on if the substance can be electro-deposited on the lead. Do you know how we can do this?

A.—As far as we know or are able to ascertain, there is no means of putting a deposit of carbon on lead, or on any other metal, for that matter.

—Oliver J. Sizelove.

Tool Lubricants as Problems in Metal Cleaning

A Film Between Metal and Tool

By F. H. GUERNSEY

Director Sales and Service, Cowles Detergent Company, Cleveland, Ohio

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE metal working industry consumes large quantities of various lubricants in the form of oils, fats or "compositions" for the purpose of protecting metal and tools by lubrication and cooling in the various stamping, drawing, and spinning operations.

The oils, fats, and greases afford an almost unlimited number of choices and combinations. Altogether too often the composition of lubricants is determined more by fluctuations in the oil market than by their desirability for the purpose intended especially when the manufacturer is facing a rising market and endeavors to escape losses by questionable substitution.

The function of a lubricant is to reduce wear and tear upon metal and tools, producing a smooth surface without "bite" and lengthening the serviceable life of the tools. Cooperating with the metal and tool is a rugged and satisfactorily permanent film between the metal and tool. The adhesion or film-forming capacity of the lubricating material upon the metals is therefore of prime and basic importance.

The Film Must Stick—To Lubricate

The development of film (adhesion) is progressive and proceeds rapidly for a number of hours. Adhesion varies with different metals and often with only slight differences in the alloy composition of a given metal such as steel. Adhesion, being a surface phenomenon, would be expected to be subject to variation due to the presence of surface impurities, and this is exactly the case, as in the presence of oxides, rust, etc.

The difference between various oils from the standpoint of lubrication has led to intense study of the differences between various lubricants. For tool lubrication, there has been a preference for animal and vegetable oils which seem to have a film-forming capacity superior to that of ordinary mineral oils. Experience indicates that the straight mineral oils are slower to build up a film, though the ultimate film may be considerably thicker than the film produced by a vegetable or animal oil.

The thickness of the film, however, is not an index of the lubrication value since the permanence of the film, a function of its structure, is of greater importance than thickness. Thus, a thin, tightly-adhesive film has a greater value than a thick, loosely-bound film. The film must also conform satisfactorily to the shape of the tool. There is evidence that the mineral oils are more compressible than the fatty oils.

What Makes the Film Adhere

Investigators, noting a difference in film-forming capacity between straight mineral oils, are striving to identify those active groups or derivatives which influence the film-forming capacity of the oils and, to construct compositions of definite and tangible lubricative value, by elimination of those which impair the adhesiveness, and by addition of reinforcement.

It has been well-established that the adhesion is primarily due to selective adsorption by the metal surface. The tighter this adsorption the more durable and permanent the lubricative film.

The tendency of some lubricants to travel ahead of the heat as it progresses through metal is well known, and is a primary cause of unsatisfactory lubrication where the friction load is considerable. A fixed film will not travel, or at the most will travel slowly. A good lubricating film is always present in the vicinity of the tool.

Organic acids, some unsaturated hydrocarbon derivatives, and some combined sulphur derivatives have been recognized as examples of film-forming constituents and as a natural deduction, the addition of small quantities of fatty acids to some straight mineral oils should increase their film-forming capacities. At least the claim is made that free fatty acid is the active constituent of the fatty oils, and additions of free fatty acids to mineral oils to increase their adhesiveness is successfully practiced.

How the Oil Lubricates

The process of lubrication may then be summed up as, (1) application of oil to metal surface; (2) with a lapse of time certain constituents in the oil work their way to the metal surface; (3) these constituents are adsorbed on the metal surface in the form of a loose chemical combination, thus constructing a foundation film, tightly adhering to the metal surface; and (4) with further lapse of time upper layers of oil build up the thickness of the film; (5) Research has revealed that in a good lubricant the molecules, in forming the film, stand on end, bunched so to say in broom-straw fashion. The bunched and erect arrangement of the molecules contributes to the physical strength of the film in keeping the metal surfaces apart.

Since the upper layers may be removed much more easily than the foundation film (which probably constitutes 5 to 25 per cent of the total thickness) it is demonstrated that adhesion is much more important in lubrication than cohesion.

The Properties Needed in a Lubricant

From the standpoint of sheet metal lubrication for drawing, stamping, etc., the chief physical properties demanded of a lubricant are: (1) sufficient viscosity to prevent any considerable loss by dripping away from the metal and a retention of this viscosity at working temperatures; and (2) a rapid and substantial film development.

Mineral Oils

The mineral oils are known as hydrocarbons and these cannot be saponified to form soap. The two main classes of mineral oils are those from a paraffin base and those from an asphaltic base. The former type seems to be favored as a lubricant, though such preference is probably diminishing. With the exception of free fatty acids, the active film-forming groups do not exhibit pronounced chemical properties.

Many semi-solid mineral greases contain metallic soaps, such as calcium, magnesium, aluminum soaps, etc. These ingredients, in addition to serving to increase the viscosity of the oils to which they are added, will contain considerable ash as is revealed in scaling. These metallic

soaps are very water-repellent and consume acids and alkalies chemically.

Fatty Oils

The fatty oils are mixtures of materials composed of hydrogen, oxygen, and carbon. They are essentially glycerides of the fatty acids. The predominating acid in the oils (or liquid fats) is the unsaturated oleic acid, while the proportion of the saturated acids, stearic and palmitic, increases as the solidity of the oil or fat increases. They (the oils) are saponifiable by alkalies to form soaps and glycerin.

Practically all commercial oils contain some free fatty acid which is the active principle in adhesive film forming. In fact, prolonged action of the fatty acids upon metal will occasionally attack or combine sufficiently to pit the metal.

Certain fatty oils will absorb oxygen from the atmosphere and tend to dry. Three classifications are designated on this basis as "drying," "semi-drying," and "non-drying" oils, though members of the latter class will absorb small amounts of oxygen. This so-called drying process results in the formation of a varnish-like film which in time will become very hard. Linseed oil is an outstanding example of a drying oil, while lard oil is a good example of a non-drying oil.

Rancidity and fermentation, resulting in an increase in the fatty acid content, is common among fatty oils, particularly when refining methods have not been thorough and an assisting moisture content is present.

Sulphonated Oils

Sulphonated oils or "soluble oils" are the result of reaction between strong sulphuric acid and an oil, the reaction being controlled at moderate temperatures. Many of the oils may be sulphonated but the most common is sulphonated castor oil, or an oil containing a large proportion of ricinoleosulphuric acid. These oils are mostly used in mixtures with other lubricants to produce a lubricant which readily mixes with water, the latter being of value as a cooling agent in tool lubrication. The greater the degree of sulphonation, the more soluble the product will be in water.

Mixtures or "Compositions"

These materials are blends of certain oils, fats, waxes, etc., to produce a lubricant having composite properties. In some of the heavier compositions one often finds mineral lubricants, such as talc, amorphous chalk, zinc oxide, lithopone, lead compounds, etc. These materials contribute a permanence factor to the lubricant but often complicate matters by a slow chemical reaction with the oil constituents: It is extremely important that these compositions be so prepared as to retain a homogeneous condition. Separation of any of the constitutents from the body of the composition is likely to upset the entire balance of properties.

When the Lubricant Meets the Cleaner

Good lubrication is primarily a matter of adhesion, and as adhesion usually increases with time up to a certain point, the firmness of the adhesion and age of the film have considerable bearing on the removal.

Removal by scaling is not altogether satisfactory, because of the heavy pickling required to remove rust and ash from the metal surface. Heavy pickling opens the way for troubles from hydrogen absorption by the metal, and later blisters, an imperfect adhesion of ground coats.

Chemical cleaning by the wet process is satisfactory, provided the conditions involved are understood.

Alkaline detergents, with or without soaps, are generally used in the first operation at 140° to 200° F.

The efficient cleaning solution first "wets" the oily surface. If the oil in question is practically a pure mineral oil, the cleaning solution must have a low interfacial surface tension to accomplish effective wetting.

Agitation of the cleaning solution is important at this point because when once wetted, the oil will begin to adhere to colloidal elements and break away.

If the oil is of the fatty glyceride type, or contains considerable such oil, a direct reaction between the oil and the alkaline medium in the solution will produce sufficient soap to increase the wetting power and speed up a loosening of the oil.

The efficient cleaning solution will be capable of emulsifying the separated oil by enveloping the oil droplets in a tough resistant film which prevents their coalescence or re-attraction toward the metal surface.

The Colloids Stage a Tug-of-War

The cleansing operation has thus far proceeded only through the upper layers of the lubricative film. The basic adhesive film which is in direct semi-chemical contact with the metal resists wetting to a greater extent than the upper layers, due probably to the presence of an iron soap or iron ester with some active adhesive organic substance in the lubricating oil.

The adhering absorbed film must be disrupted and separated from the metal surface by counter-action. Effective cleaning solutions will possess colloidal properties which will exert a colloidal pull or force of greater magnitude than the adhesive force between the metal and the film, and in the opposite direction. A chemical action, replacing the iron in the film complex with a soluble alkali base, operates in conjunction with the physical colloidal action with the result that the film constituents are separated and taken up into suspension by the cleaning solution. The cleaning solution displaces the film and wets the metal surface itself.

Lubricants containing metal soaps, pigments, or drying oils require additional chemical action to consume their resistant elements.

As some time is required to build up a tight lubricating film, time is likewise required to disrupt and disperse such films. The more complicated the structure of the film, the more exacting the requirements of the solution.

And Finally

The destruction of the film should be so complete that there should be little danger of re-adhesion during the rinsing operation.

Free rinsing of detergents and suspensions, and clean rinse tanks, are essential to prevent oily constituents and soaps from being carried into the pickle tank to hinder the action of the pickle. Soaps are destroyed by pickle, setting free their combined grease which in turn contaminates the neutralizing tank and is probably retained as a contamination on the ware as it passes on to subsequent operations.

Lubricating oils should be selected primarily from the standpoint of serviceability and secondarily from the standpoint of cleanability.

Lubricants of composite desirable properties combining serviceability and cleanability with versatility providing protection against variations in the metal stock being worked may be created by intelligent study of the set of conditions involved.

Aside from variations common to all products of nature, the composition should be religiously maintained as unanticipated changes may result in troubles extremely difficult to trace. Cleaning solutions should be capable of dispersing the closely bound film as well as the upper and more loosely held portion.

Modern Job Shop Practice

Higher Standards and New Developments in the Plating Trade Have a Far Reaching Effect on the Job Shop

By JOHN N. KELLY
President, The Globe Rustproofing Company, Cleveland, Ohio

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE past five years have wrought radical changes in the methods employed in the operating of a job plating shop. The swift strides taken by the industry have found the job plater confronted with many new problems. The development of the salt spray and other tests and their sudden adoption by the users of plated materials have made it necessary for him to look at his work from new angles.

A steel stamping, for instance, oiled out, heavily plated with copper, buffed and given a heavy coat of dense nickel could be buffed to a finish that would delight the eye.

For years, that had been the accepted procedure. Then suddenly, trouble and plenty of it developed. The brilliant pieces were rejected as the engineers demanded that they stand a laboratory test, usually the salt spray.

The plater, proud of his job, had sent the finished product to his customer. One or two pieces were put into the salt spray and failing to stand the test a reasonable time without rusting, the entire shipment was rejected. The plater investigated and found that the electro-potentials of metals, something of which he had never before heard, had brought about his downfall in the salt spray cabinet.

Copper must be kept from contact with steel, but its many advantages as a base for nickel must be utilized. Then a new procedure was adopted. The article must be given a heavy nickel strike before copper plating, but more than that, the amount of metal deposited must be known.

"An hour in the nickel" meant nothing to an engineer. The plater must express his process in ampere minutes per square foot. Every tank now must have its ammeter and rheostat and plane geometry haunts the cathode rod.

The area of complex articles must be computed and the clock tells the plater when to unload his tank.

The plater, always a horse for work, buckled to his job and found another labyrinth. Crowding amperes through his tanks to cut his plating time, spoiled his work. Some solutions pitted and others burned the work. Fewer amperes per minute meant more minutes in the tank. A line of nickel tanks which had formerly been adequate were now tying up his polishing line with no relief in sight, save the addition of more tanks. Sometimes he lacked the room for another line, and sometimes the money to buy expensive tanks, tank equipment and metal. In many cases both combined to pound his weary head. But, fox-like, the plater found his hole in the fence.

He learned that a hot nickel solution plates many times faster than a cold one. But he also found that a hot nickel solution is as delicate as an infant. Its diet must be strictly controlled and the doctor summoned at the first sign of distress. Each tank was given a steam coil and thermometer and the plater put on the long linen coat and the cold eye of the chemist. Litmus paper goes out of the window and the comparator test for acidity becomes a precise instrument in his hands. He adjusts the metallic content of his tanks and with another kit of test tubes keeps them right.

Things hum, and a wiser plater surveys his work. His tanks are plating as they never plated before. Glancing at the instrument board he can tell you what is going on in that clear green liquid that he now knows so well. A definite number of amperes per minute of plating in the proper sequence, will give him a definite number of hours in the salt spray test. And he has his own salt spray running over in the corner to prove it. Tests and timing are made a routine in the day's work. The notes on the blue print specifying a certain number of hours in the salt spray no longer frightens him. He knows what they mean and he figures his processes and price accordingly. Peace descends on his house and he sits down to rest a while.

But there is a rumble in the distance and he rises from his stool to see a flash of blue white brilliance. Chrome, the magic finish and the toughest baby of them all, is here. He lays down his pipe and rolls up his sleeves.

Large "Still" Cadmium Plating Tank

Here was an adversary that drove the plater back to the very foundation of his shop. Chrome demanded generators of a size unheard of in the job shop trade. New panel boards and heavy power lines must be installed to run the motors and the size of the bus bar taxed the man's imagination and his purse.

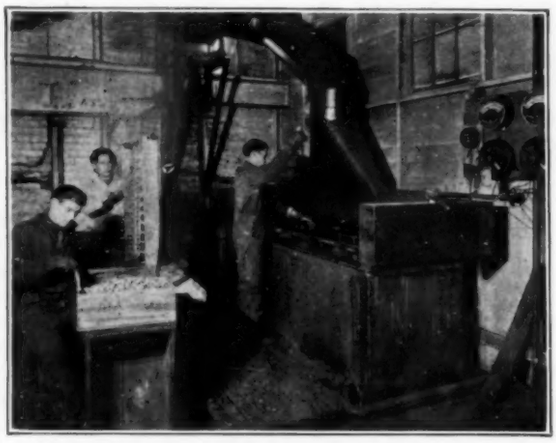
This done the plater found two allies standing by to help him. Ventilating engineers stripped the process of its deadliest weapon, the spray generated during electrolysis. Nothing like it had the plater ever met before. Heavier than air and both gas and liquid at the same time, with the power to drive a workman from the tank at the first whiff of the membrane destroying poison.

Fans and ducts were built that overcame this difficulty,

but chromium still had its pitfalls. Poor throwing power and different kinds of plate at varying degrees of current density and temperature.

The plater turned for help to his other ally, the electrochemist, who gave freely of his findings. Laboratory research showed the way and the plater studied carefully the results, applied them to his chromium tank and found them to be correct and complete.

This done, other things remained. Problems of racking for the plating of various shapes and the necessity of



One of Three Large Chromium Plating Units. Chromium Capacity, 1800 Gallons.

isolating the chrome tank from the other plating tanks. The plater found, many times to his sorrow, that a trace of chromic acid in his nickel or cleaner tank was deadly. If the scrub boy but place a chrome rack in the nickel tank, that nickel tank was out of service. And so each chrome tank became a plating department in itself and the plater found that at last he had this tiger tamed.

All this was done under the most trying circumstances. The manufacturers adopted chromium before the job shop trade was ready and while the plater grappled with his problems, his customers belabored him for his slowness in delivering. Those hectic days have passed and two things must be remembered. The thanks of the plater is due the men who worked out their problems in the laboratory and so generously passed their findings on to him, and the thanks of the manufacturer must go to the plater who rose to the occasion and gave him chromium plating, in spite of the havoc it created in his shop.

Things the plater learned in the period before chromium came, helped him vastly in his contact with the new problems that chromium presented. His familiarity with the electrical phase of his business stood him well in his new venture and his improvement of his other processes had told him the value of exact procedure and knowledge of the composition of his solution. Also chromium fitted well into his plant, for his knowledge of copper and nickel plating gave him an excellent foundation on which to apply the thin but everlasting coat of chromium.

One thing still remained to be done. The plater must now assume the role of production engineer, but he is a man of parts, and, without batting an eye, he took out his pencil and his stop watch.

Heretofore, all plating shops were laid out in "lines." There was the polishing room, and sufficiently removed from it, the plating room. This was all right in a day when your polished work went to the tanks and came back to the line to be buffed. And it was not so bad if the first buff was copper and the parts had to make the round trip again for nickel.

But now chromium has given it another ride around the plant. The plater finds that when he has to polish and then buff three times with trips to the plating room in between, the loss of time and cost of handling his work is exorbitant.

Confronted with this he changed the straight lines into circles. Using his nickel tank as a beginning, he plates his nickel strike and then his copper in a nearby copper tank. He broke up his polishing line and planted a lathe between his copper and his final nickel. Here his copper was buffed and after nickel plating handed back again to be buffed before chromium plating. Into the chromium tank it went and another lathe was there to buff the chromium. The endless trafficking of work to a line of polishing lathes was eliminated. Instead of feeding work to polishers from all corners of the plant, the polishers were distributed to points as close to the plating tanks as practical.

As a result a job need not leave any section of the plant until the shipping clerk takes it away. Today a modern job shop is a series of complete circles, each capable of entirely finishing a job, and the number of circles is limited only by the size of the plant. A series of lines, each limited to one operation is "out" and the plater finds himself turning out as many different jobs at one time completely processed as he has circles in his plant to do the work. Gone is the plater who prowled mysteriously among his tanks and mumbled evasive answers to those who sought knowledge of his craft. The whole business

Part of the Polishing Line on the First Floor of the Globe Plant.

is now out in the daylight and is as precise and accurate as the present demands of industry can make it.

The man who buys plating, if he is a manufacturer, must realize that modern plating presents as many complex problems as does his own business, and that the modern plater handles them as capably as his own are handled by his plant engineers. Cost records are kept and promises are made with a thorough knowledge of his plant and its capacities in mind. Specifications are considered with intelligence and are met with a degree of certainty that five years ago would have been impossible.

Galvanized Tank for Cyanide Copper

Q.—I have a heavy galvanized tank and would like to be advised as to using it for a copper cyanide solution. Would the cyanide have any effect on the galvanize?

A.—It is not advisable to use an iron tank that has been galvanized for a cyanide copper solution, if the color of the deposit will cause you any trouble. The zinc from the tank will go into solution and cause the deposit to have the appearance of a bronze or brass plate.

—Oliver J. Sizelove.

Enameling Aluminum Castings

Q.—WE are greatly interested in knowing full details of the process required for enameling aluminum parts. We are referring to ordinary oven enameling. The process is to be applied on external parts of a standard typewriter manufactured in our plant in Italy.

Therefore we need high grade finishing and perfect adherence.

A.—1. To secure the best results on aluminum castings the work should be ground and polished in the regular way to get a smooth surface.

2. The work should then be washed in benzine to remove all grease.

3. Coat with a high grade black baking japan primer, either by dipping or spraying (air brush at 60 lb. pressure).

4. Bake 1½ hours at 350 to 450 deg. F. or 176 to 232 deg. C.

5. Spot putty mixed with small amount of primer to give black color, to fill all pin holes and defects in the metal.

6. Give second coat of black primer.

7. Bake 1½ hours at 350 to 450 deg. F., or 176 to 232 deg. C.

8. Rub down with No. 320 sand paper to remove all marks and unevenness, being careful not to rub through on corners, edges, etc.

9. Give first coat of finish black baking japan, either dip or spray method.

10. Bake 1½ hours at 350 to 456 deg. F., or 176 to 232 deg. C.

11. Give second coat of finish black baking japan.

12. Bake 1½ hours at 350 to 450 deg. F., or 176 to 232 deg. C.

The higher the baking temperature, the shorter time required for baking. Only sand after second priming coat; it is not necessary to sand the finish coats. More even coats and better results will be secured by spraying instead of dipping. If spray is used, reduce consistency of primers and finish japans with the reducers suitable for the make of material used to the point where the air gun gives best results. Sixty pounds air pressure does effective work with japans.

Nitrocellulose lacquers may be substituted for the finish black japan coats but the wearing qualities are not as good as japan coatings. The lacquer coats, if used, may be baked at 200 to 225 deg. F., or 93.3 to 107 deg. C.

There is no economy in using cheap or low grade materials either in japans or lacquers. The high grade have the best covering power and give the longest wear. If the above directions are carried out with care taken to see that the work is clean, when coated, in clean dust proof work rooms, the finest grade of work can be secured.

—WALTER FRAINE.

Electrolytic Separation of Tin

Q.—WE have a problem in the electrolytic separation of tin that, no doubt, you can help us with. In writing this problem, we have before us your article on electro tin plating which appeared in December, 1926, page 502, and the improvements given in June, 1929, page 267.

Our anodes are made up approximately of 60% silver, 35% tin, and the balance in small amounts of copper, zinc, and cadmium. We are interested in saving the silver and tin.

Would an electrolyte of the composition you suggest be suitable for this work? Of course, the cathodes are of sheet tin, and the quality of the surface is immaterial as long as it plates on hard. Are there any alterations that might be made? We can easily test more than one electrolyte to determine which will give the best results. Our generator is 5-6 volts, 100 ampere.

We usually work it around 50-60 amps., or whatever is required.

Providing your electrolyte is adaptable, is the hydrated tin oxide, the stannous or stannic oxide? What additional agents would you recommend in this case, and approximately how much of each? If there are any special methods of making up these agents, we would appreciate such information.

A.—It would not be advisable to attempt to refine an anode of the composition given in your letter in a tin solution of the composition published in our December, 1926, and June, 1929, issues.

The solution is for the electrodeposition of tin for protective or ornamental purposes. It is doubtful whether silver could be deposited from such an electrolyte, and if it is not, the anode would be polarized and thereby prevent the passage of current.

Cadmium and zinc would be deposited with the tin. Copper, when in sufficient concentration, would decrease the cathode efficiency and might be the cause of no deposition of the metals.

—ELECTROCHEMICAL ENGINEER.

Potassium Dichromate Rust Preventive

Q.—It is quite extensively understood that potassium dichromate prevents rust. We are very much interested in rust prevention and would like to know the various ways that these crystals may be incorporated with oil. This will afford us the rust-proofing properties of potassium dichromate and at the same time give us a protective oil film on the surface of our work.

Any information about the use of this material for rust prevention will be appreciated.

A.—Potassium dichromate is only of value as a rust preventive in water solution. Its protective property depends upon the formation of a passive film upon the metal surface. This film will not form unless the crystals are dissolved in water and after it is once produced will not afford any lasting protection if the metal is removed from the solution.

Any attempt to incorporate this material in an oil or grease would necessitate forming an emulsion of these materials with a water solution of dichromate. Such an emulsion would be no more adherent than the oil or grease above and would be rather expensive to make.

—A. K. GRAHAM

G. Dupbernell—Correction

In our August issue, on page 372, the author of the article, "A Report on the Possibilities of Poisoning from Cadmium Plate," was given as George P. Dubperriell. This was an error. The author's name is G. Dupbernell.

Voltmeters and Ammeters

The Importance of These Instruments in Plating and How to Use Them

By GEORGE B. HOGABOOM
Electroplating Engineer, Hanson-VanWinkle-Munning Company, Matawan, N. J.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

WHEN definite results are to be obtained there are always rules or instruments by which to measure what has been done. It is proverbial to measure by a "yardstick"—a standard which has been accepted. Without some standard of measurement no comparisons can be made and no data for future reference can be assembled. If there is no reliable data it is almost impossible to build a process from which consistent performance or results can be had. "Almost impossible" is probably not strictly correct. Yet how can one explain the production of acceptable work from the average plating room?

The electrical engineer has adhered strictly to his yardstick when designing and constructing the generator, the voltmeter, and the ammeter. The plater accepts the performance of the generator as a matter of fact and the instruments as an indication of how well it is doing its work. It is only of recent years that he has come to realize that the instruments can also be used to help measure and to regulate the quality of his work. The first electrical instrument to be accepted by the plater was the voltmeter. The behavior of the plating solutions, the character of the deposit, the amount of metal deposited were measured by the voltmeter. In all the discussions with fellow platers the number of volts used on the several plating solutions was a topic of utmost interest. Only a few years ago, which seems as but yesterday, the scientist became more interested in electroplating and his electrical discussions were all about amperes. He smiled covertly, sometimes more openly, at the statements made by men who had spent their lives with the voltmeters, or, to be more correct, generally a voltmeter at the generator with probably a point switch. The technical man too often went to the other extreme and insisted that the amperes were the all important units regardless of the number of volts it required to obtain the desired pressure. He may be correct but so far has not established a sufficient data to sustain his point in the electroplating of metals for ornamentation.

The voltmeter and the ammeter both are necessary not only on the generator panel board but also on every plating tank; the ammeter to tell approximately how much metal will be deposited in any unit of time; the voltmeter to indicate whether the electrical contacts and the solution itself are in good condition. All day yesterday 250 amperes were had at 3-volt pressure on a cyanide copper solution. Today when the batch of the same class of work was put in the tank it required a pressure of 5 volts to get the 250 amperes. Why? It may be that the temperature of the solution is lower; that the free cyanide is not as high as yesterday; that the bus bar connections or the contacts at the anodes are corroded. Correcting any one or all of those conditions will have caused, in all probability, the needle of the voltmeter to fall back to the 3-volt point. With a voltmeter alone and the rheostat adjusted until 3 volts were indicated the required current would not have been had and the amount of copper would have been less. The buffers would be cutting through and then—a disagreement. The work was plated exactly the same as that of yesterday and the voltmeter is the evidence; or, if an ammeter were used, that would be offered as evidence. If both instruments were used intelligently there would have been in all probability no cutting through work to create a discussion; and, if there had been, the fault could have been definitely placed where it belonged—to the buffing. The plater of today is recognizing the value of the ammeter and the voltmeter and their presence on each tank always indicate a progressive manufacturer and a capable foreman plater.

There is one point, that the plater and the technical man, both the chemist and the electrician, have not given enough consideration, and that is, the effect of the varying surface areas of both the anode and the cathode. In electroplating there is a constant diminishing of the anode area. Even when new anodes are put into the plating bath little or no attention is given to what change may have been made of the surface area and what effect such a change will have. There is a change of active surface area when the anodes become partly or wholly passive. In measuring the anode area only the active area can be considered. Cathode areas change—very often with each load. Due to the shape of an article or its distance from the anode only an average current density can be had. So many are misled by endeavoring to measure the thickness of a deposit with a micrometer and from that cal-

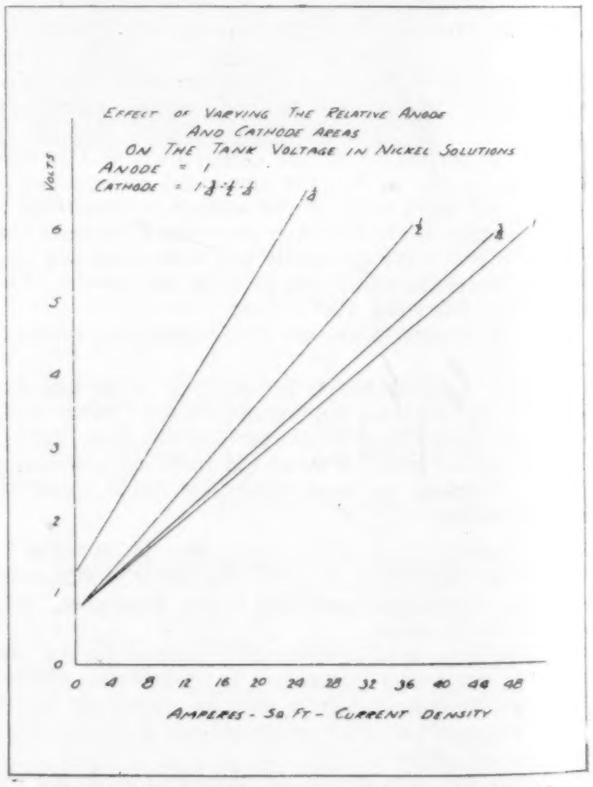


Fig. 1—Effect of Varying the Relative Anode and Cathode Areas

culating the number of amperes per square foot used. The current density on one part of an article may be several times that upon another part. Mesle pointed this out in his excellent paper on Silver Plating (See THE METAL INDUSTRY, March, 1929, pages 128-130). The total amount of current used upon a certain batch of

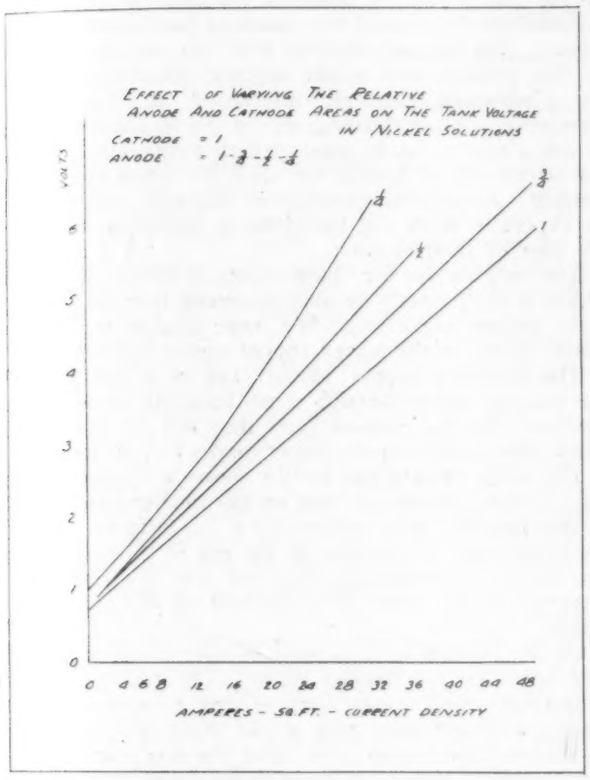


Fig. 2—**Effect of Varying the Relative Anode and Cathode Areas**

work is the only figure that can be used and it must be considered as the average current density until more is learned about the distribution of deposits.

The effect of varying the relative anode and cathode areas on the tank voltage in nickel solutions is illustrated in Figures 1, 2 and 3. The nickel solution used was made according to the formula published in a recent article.* The anode and the cathode area, when the relation was 1-1, was 2/9 square foot. The distance between anode and cathode was 4 inches. It must be understood that the figures given are only for the conditions under which they were obtained and cannot be applied directly to any nickel solution. They are indicative of what exists.

Figure 1. It is doubted if ever nickel solutions are operated at a lower pressure than 2 volts. When 2 volts are used and the cathode area is only ¼ of the anode area a current density of 3.8 amperes is had. When the areas are equal, 12 amperes per square foot are obtained. Some solutions are run at a pressure of 5 volts; the difference in the current density is more marked. With a cathode ¼ of the anode 18.2 amperes per square foot are obtained while with equal areas 41 amperes can be had.

Figure 2. As the anode area changes due to corrosion or to polarization it is of interest to note the effect of that variation when the cathode area is constant. The same effect would be had if the cathode area was increased in the same ratio beyond the 1-1 ratio given in Figure 1. At a pressure of 2 volts a current density of 7 amperes per square foot is recorded when the anode area is ¼ of the cathode. A current density of 12 amperes per square foot can be had if the areas are equal. Taking 5 volts again it is found that with the anode ¼ of the cathode 25 amperes per square foot can be obtained and when the areas are equal 41 amperes.

In Figure 3 the voltage is kept constant. This clearly illustrates that the voltmeter alone has no value on a plating tank—there must also be an ammeter.

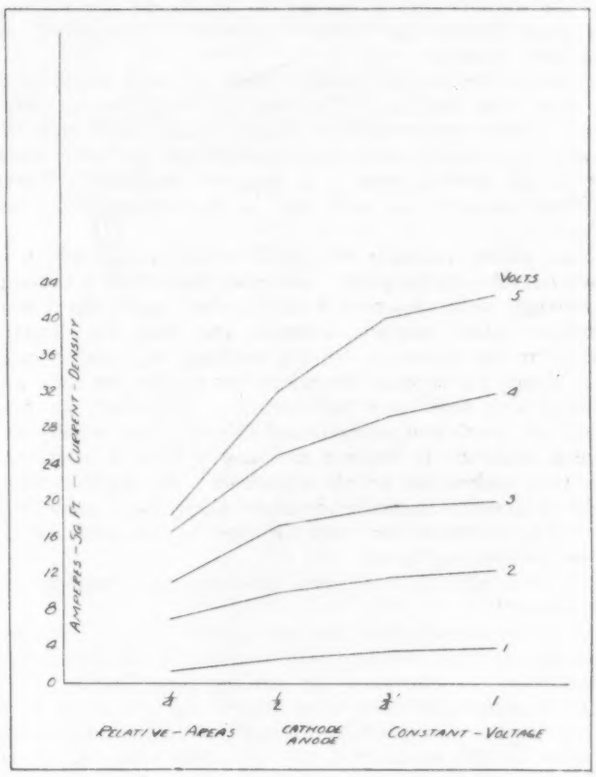


Fig. 3—**Relative Areas**

It is believed that the graphs given are self-explanatory and will in all probability assist in clearing up a question that has been the subject of discussion times without number. The electrical engineers have given us "yardsticks" by which better plating can be had. Let us use them.

Cadmium in Nickel Solution

Q.—Please tell me what happens when metallic cadmium accidentally gets into a nickel plating solution. How could I eliminate this cadmium without affecting the solution?

A.—I do not think that metallic cadmium in a nickel solution will do any harm, unless in contact with the anode when it would go into solution and be deposited. Filtration would remove metallic cadmium, but not a cadmium salt.

If an excess of a cadmium salt is added to a nickel solution, the deposit is very brittle and has a bluish color. To remove same, place some old racks or work on cathode rod and work solution with a high current density until it has been removed. —OLIVER J. SIZELOVE.

*Nickel Solutions, by George B. Hogaboom, THE METAL INDUSTRY, April, 1929, pages 172-175.

Hot Tinning Pressed Copper and Tin Plate

Q.—We are sending you samples of a number of pressed melon moulds and other moulds, some of which are made of tin plate and some of copper. We give these moulds a coating of tin by hot dipping and have experienced some trouble in getting our products tinned perfectly.

Taking first the copper moulds, these are sent to the tinning plant immediately after they are made and they are treated as follows:

We dip the plain copper moulds in nitric acid, then we dip them in a solution of killed muriatic acid. We then dip the moulds into a tin pot in which we use nothing but pure Straits tin. After the work is completed, we find some defects.

Some of the copper moulds show up with black spots on them (see sample). This we believe is due to something in the copper itself. Some moulds show that the copper has refused to be covered with tin, and some come out of the tinning pot in a peppery condition. These different defects you will find on the samples that we submit.

Now please examine the small melon mould which is made out of coke tin plate. We give this article a dipping in muriatic acid (solution 4 to 1), then again dip it into a milder killed muriatic solution, and then dip directly into a tin pot in which we use nothing but pure Straits tin. When the moulds are taken out of the pot they are brilliant and look very satisfactory. However, we find when the goods are papered and in stock that some parts have a tendency to become dull and yellow, a discoloration that makes the article unsalable. We tumble these items in sawdust immediately after taking them out of the tin. The discoloration may be due to moisture which causes yellow oxidation.

We trust that your experts can suggest a remedy for our difficulties.

A.—The black spots on the tinned copper articles, when removed by rubbing with a rubber eraser or a knife point, show an unbroken tin surface underneath. This would indicate that they were picked up in the tin bath and the spots are probably "scruff" combined with dust particles on the surface of the bath, which would collect when the moulds were leaving the bath. There is positively nothing in the copper itself that could cause this trouble.

In tinning sheets these black spots appear and the remedy consists of regular and careful skimming of the exposed surface of the bath.

You do not mention any cleaning operation performed after the moulds leave the presses. In the usual practice, the lubricant used on the dies leaves a fine film of oil on the article drawn. If this is not removed it will be a cause of trouble. If nitric acid is used as a bright dip and the shells go from the press room to the nitric acid dip without any intermediate treatment, the action of the acid would be retarded and give a bad color to the shells. This would be a cause of bare spots on tinned pieces. We are not familiar with the use of nitric acid in this process and would suggest substituting one of the commercial cleaners, advertised in THE METAL INDUSTRY. After cleaning, dip in the flux and tin. The proper cleaners can be used at high temperatures, giving the advantage of having the shell hot when fluxing and tinning. Some firms specialize in this work, and will send an expert to work out the cleaning details at no cost to the user of their cleaners.

The only reason for "bare" spots in tinning is that the article is not properly cleaned, assuming that the flux used is in proper condition. We were unable to find any "bare" spots on the tinned copper mould submitted.

The untinned copper moulds are in a bad condition for tinning, either through much handling or because of the time that has elapsed since they left the press room. They show tarnish spots, finger marks and oil spots.

The large rectangular mould shows a "peppery" condition more pronounced than on the smaller mould. This is accompanied by a yellow color on different parts of the mould and is indicative of the use of tin that was too hot. The tin should not run over 600° F., and is even better as much lower as will admit of the tin running freely.

On the "melon" mould made of coke tin plate, we note bare spots on the flanged edges. The tin mill practice in tinning "iron" sheets, born of long experience in producing a tinned sheet that would resist tarnishing, that is, showing the brown spots after the sheets are in stock any length of time, differs in detail from your practice. The flux used is a zinc chloride. This material is manufactured ready for use as a flux. The sheets, after cleaning, are passed through the flux, then through the tin bath, and leave the tin through palm oil and then are dry cleaned with bran or middlings. This is wholly a machine process, but the method can be adapted to manual handling.

In regard to your own practice, if good work is produced over a period of time and then faulty work appears, it is obvious that some detail of the work has been slighted or the material used not kept in condition, and this can be corrected only by careful study of each operation. If the work is consistently bad, the process should be changed. —WILLIAM J. PETTIS.

Chromium to Resist Citric Acid

Q.—We are confronted with a problem in regard to the feasibility of chromium plating iron for resisting the chemical action of citric acid.

What we are particularly interested in is whether a thickness of one-thousandth of an inch of chromium plated directly on iron would present a pit-holed surface through which the citric acid could attack the iron. Also, we are interested in whether or not there is any chemical action of the citric acid on the chromium.

Would a copper, nickel, chrome finish be necessary to protect the citric acid from any contamination?

A.—The most satisfactory coat would be a heavy copper plate, buffed before nickel plating, followed by about a 30-minute chromium deposit. Chromium alone would be of no value and the thicker the copper-nickel coat the better. If the iron is a casting it is doubtful whether any plated coating will serve to overcome the porosity of the base metal.

While copper, nickel and chromium are quite resistant to citric acid, Monel, Everdur and 18 per cent chrome iron may be used. The chrome iron is of no value if the citric acid is over 6 per cent and if the problem is in connection with the handling of foods containing citric acids. The manufacturers of these alloys should be consulted.

No metal other than the noble metals will be entirely insoluble, but the contamination resulting from these chemically resistant materials would for most purposes be negligible. —A. K. GRAHAM.

Accurate Costs in the Plating Industry

Some Unfavorable Observations on the Job Plating Industry

By SIDNEY SATENSTEIN

President, National Chromium Corporation, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

IT has become almost an axiom that no industry or business can progress or survive unless some accurate knowledge of costs are maintained. It appears to the writer, from what observation he has been able to make in the job plating industry, that very little attention is given to the seriousness of this problem.

There cannot exist intelligent competition unless there is a true knowledge of cost. By intelligent competition I mean, knowing to almost a certainty how low one can estimate and still maintain a true profit.

A plant operating apparently successfully and measuring its success by the fact that at the end of the year its profit and loss statement shows that they have netted a profit on the operations proves nothing but good luck, because there may be any number of jobs in the plant which, if analyzed would show a loss, and other jobs showing a large profit, consequently the jobs showing a loss are depriving them of the larger profit.

Estimating on the basis of a general overhead is fallacious in the extreme, and not only unfair to the plater, but to his customer as well. Modern business and modern competition, brings a demand on the plater and manufacturer to know his costs accurately for each department in his plant, and through this means, knowing the cost of each job.

The solution therefore, becomes evident that to successfully run a business and compete successfully, knowing when you can reduce your prices and when you cannot reduce them, one must know within a resonable degree of accuracy the departmental hour costs.

Departmental Hour Costs

This is a simple matter. Let us take one department in the job plating industry, as an illustration of how one may arrive at the accurate cost per hour. For the purpose of this illustration we shall take the polishing department as it is probably more interesting to the average plater as far as the matter of expense goes than any other department.

We will assume that the polishing room requires a total area of 6000 square feet of which the cost of one foot is a $1.00 a year, giving us a total of annual rental for this department.....	$6,000
By a fair distribution of electric current bill the lighting would probably amount to.....	$ 250
Let us assume that the equipment is worth $15,000. Depreciating this equipment and allowing for repairs and renewals at the rate of 20% per annum the charge would be	$3,000
Interest on investment would be 6% of $15,000 or	$ 900
Insurance and compensation insurance which can be accurately estimated will be	$1,500
The costs of materials used, consisting of wheels, buffs, polishing compounds, cotton gloves and all other supplies, can be estimated from the total amount of purchases made for this department for a year's time, less inventory, possibly about.....	$9,600
Dividing the time of the porters into their respective departments we arrive at a figure of.....	$1,400
Assuming that the superintendent and his office space costs $8,000 a year and 25% of this cost can be attributed directly to the polishing department we must allow them the sum of.....	$2,000
Two foremen working 52 1/7 weeks each at $60 per week amount to.....	$6,257
Power bills, which can be accurately arrived at by a compilation of these bills and divided by the number of horse power consumed in the department, would probably run about.....	$4,000
Total	$34,907

The above figures of course are entirely assumed, such assumptions being based on running 32 polishers. Figuring producing labor at a $1.00 an hour and having as an allowance for loss of time 10%, we would have a producing labor cost of $1.10 per hour; 32 polishers working 2,210 hours each per year would give us a total of 70,720 hours. Divide this into the total overhead figures as above arrived at, which amount to $34,907 which gives us the total overhead cost of slightly more than 49 cents per hour. Add $1.10 per hour for labor and we therefore arrive at the cost of $1.59 which takes in all factory overhead items.

The above is on the basis of the plant running at 100% capacity all during the year, which is an unusual state; therefore, assuming that the plant runs at 80% capacity for the entire year, we must base our factory overhead expenses on 80% of the total working hours, which would be 61¢ per hour, or a total of $1.71.

The next thing to be considered in the cost of running this department is the administrative expense. By a compilation of various items that make up administration cost and taking what you would consider a fair percentage of this cost to be applied to the polishing department you will get a percentage to be added for administration under administrative costs. You must take into consideration all office salaries and executives in the firm, postage, stationery, printing and general expense items, carfares, legal expense, telephone and telegraph, travelling expense, floor space of the office, depreciation on furnishings and fixtures, part time of porter, etc.

Whatever percentage this is, as compared with total manufacturing expense, would be the percentage to apply for administrative expense on the manufacturing cost in the polishing room or any other department.

For the sake of figures let us assume that the total manufacturing expense for all departments is $250,000 and the administration expense is $62,500. Therefore the administrative overhead is 25%. We have already arrived at a total labor and factory cost in the polishing department of $1.71. Add to this 25% of administration expense which gives us additional 40 cents. We thus have $2.11 that every hour of polishing time costs us.

If we sell our polishing time for $2.11 it is merely ex-

changing money with someone else. To this $2.11 we can add whatever profit we feel we are entitled to, sales commissions, etc., but as the above conditions exist in all plants the principles applied thereto in arriving at these costs must all be taken into consideration.

Proceeding further, the same application of costs are made in the other departments, shipping and receiving rooms, and plating department. In the plating department this is divided up into smaller departments.

Setting up an hour cost in the nickel department is merely taking in the total space used by all those tanks pertaining directly to nickel and the expense connected with it plus the administrative cost of 25%. The same principle applies for your racking department and all other departments.

When it comes to estimating on a job, if you estimate correctly the number of hours that the job will take in each department, the rate for each department which will have already included in it the administrative cost, add to this your profit, sales commission or discount and quote the price, you will be quoting your customer on an intelligent basis. He will not be charged the overhead in departments that his work has not passed through.

Therein lies the great fallacy of the general overhead method of figuring. An average overhead is procured and this is applied to every department and therefore part of the overhead of every department is being charged to some job that does not go through these departments. This therefore causes a much higher price than this job may be really worth, whereas another job may be going through only those departments where the overhead is highest and by charging the general overhead rate you are selling this job much lower than it should be. This becomes especially important to the plating industry where it is practically all labor and service that the plater has to sell. He cannot afford not to know his costs.

There are a great many men in business for many, many years with fine reputations for their knowledge of plating, but I doubt if any of them have yet made a million dollars. Why should this condition exist? The industry is an essential one, and if run on proper business principles it can be made to pay, as well as many other like businesses of labor and service where men are becoming wealthy without the necessary invested capital or technical knowledge needed in the plating industry.

There may be organizations formed for the purpose of maintaining prices and other details of business, but no such organization can be of true worth unless it has a definite basis of figuring costs. This basis must be a uniform one throughout the industry.

My observations unfortunately go so far as to show that the average plater either lacks ambition or does not realize his own worth. There appear to be any number of shops where the employers are well satisfied if they can go home every week feeling that they have a good week's salary out of the business for themselves. If one is to work only for a salary then he might as well work for someone else. Why have all the worries of financing, equipment and labor, to receive but a salary? Too many of us forget that we are entitled to interest on our investment, to a profit on our investment and the return with a profit on every dollar we spend for labor.

Another unfavorable observation I have made, (and it is beyond me to understand), is how men with as much intelligence as those in the plating trade undoubtedly possess, can keep on with a practice, when called in to estimate on a job, such as the following.

The buyer shows the plater a sample of a piece to be done and says something like this: "We have 10,000 of these parts. What is your price?"

The plater hearing that there is a large quantity to be done immediately becomes excited, takes a piece in his hand, turns it over and over for a few minutes, mentally groping in the meantime as to how much he shall "guesstimate" per piece.

If my friends in the job plating industry would only summon up the courage to say to the gentleman, "I cannot give you an accurate price here. Send 50 to 100 to my office so that I may make a test run of it and get the time for my departments, and then I will be able to send you an estimate." You will know then that when you do send in your estimate it is accurate, and you will not be afraid to stand or fall by it. But as long as you permit the buyer to tie you down to mental estimating you are at his mercy, and it is to his advantage not only for mathematical reasons but for psychological reactions to try to tie you down to a price before you have had an opportunity to run a lot through your plant.

It therefore behooves us to know that the first principle of business is to know our costs. If for policy's sake you wish to take a loss at a job, you at least know how much you are going to lose on it.

Electroplaters' Prize Awards

IN our issue of August, 1929, we published the prizes and awards given by the American Electroplaters' Society at their Detroit meeting July 8-11. Due to the difficulties of reporting, some of the names were quoted in error. We give below the corrected list of prize winners:

Awards for Papers

1st Prize and Gold Medal—F. C. Mesle, Rochester, N. Y., "Silver Plating."

2nd Prize—Class of Newark Branch, Newark, N. J., "Experiments on Chromium Plating."

3rd Prize—H. K. Work, Pittsburgh, Pa., "Electro-Plating on Aluminum."

Honorable Mention—J. Hay, Detroit, Mich, "Chromium Plating." B. F. Lewis, Detroit, Mich., "Chromium Plating on Die Castings."

Awards for Exhibits

1st Prize—F. Weber, St. Louis Branch.

2nd Prize—George Raab, Detroit Branch.

3rd Prize—J. M. Berenato, Philadelphia Branch.

Honorable Mention—E. Hartz of Detroit Branch; The Exhibit of the Los Angeles Branch of Chromium Plated Material, and O. E. Servis, Chicago Branch.

Amperage for Silver Plating

Q.—What amperage is proper for silver plating? What amperage would you advise for silver plating 15 sq. ft. of surface area? How large should the anode area be?

A.—In general, 4 to 5 amperes per square foot is considered good practice in silver plating. With a cathode area of 15 square feet, 60 amperes could be used. The anode surface should be about equal to the cathode surface.

Upon the amount of amperage used depends the amount of silver that may be deposited, and the amperage should be controlled by the proper size of rheostat. Be sure the anode surface equals the cathode surface and if results are not satisfactory, send us a sample of your solution for analysis.

—OLIVER J. SIZELOVE.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1929 by The Metal Industry Publishing Company. Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, $2.00 Per Year. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash should be Registered. Advertising Rates on Application. Forms Close the First of the Month.

PALMER H. LANGDON.....Editor and Publisher
ADOLPH BREGMAN.....Managing Editor
THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, Beekman 0404. Cable Address Metalustry.

Vol. 27 New York, September, 1929 No. 9

Contents

THE METAL INDUSTRY is regularly indexed in The Industrial Arts Index

Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 93

Editorial

Problems of the Job Plater

TWO articles published in this issue commend themselves to the attention of every level-headed person engaged in electroplating. Mr. J. N. Kelly, President of the Globe Rustproofing Company, describes vividly the evolution of electroplating and the constant pressure for higher standards of work. In the old days any plated job was satisfactory which pleased the eye, but from time to time new elements have been brought in, making the plating business more and more complicated and difficult. As against the ancient rule-of-thumb methods of plating and inspection, we now have voltmeters and ammeters, ampere-hour meters, solution control for composition, temperature and acidity, analytical methods, measured weights of deposits, salt spray tests, compound deposits of copper, nickel, cadmium or chromium. And now there are far sighted workers in electroplating who speak of the possibility of light reflection tests for plated surfaces!

But from Mr. Sidney Satenstein, president of the National Chromium Corporation, we have another side of the picture. What do job platers know of the business side of their work? Do they know what it costs them to plate or do they know what they should charge? Do they know if they are making or losing money? According to Mr. Satenstein they do not, and we know that a large proportion of the trade will agree with him.

Here we have a situation which is obviously contradictory. The consuming industries demand higher grade products; at the same time they demand lower prices. Labor is going up rather than down. Materials do not go down. What is the answer? There is no answer except an explosion in one direction or another.

It behooves platers to look this problem directly in the face. The trade demands high grade work. The trade should pay for it. The trade demands service, promptness and reliability from the plating industry. The plating industry must be allowed to earn enough to supply these vital features. Nobody is benefited if the trade as a whole works without profit, as it means a heavy proportion of bankruptcies and a large turnover in personnel among owners of businesses as well as employees, resulting in shifting sources of supply and unstable conditions generally.

Let the job platers go squarely before their customers and say to them "We will give you the highest grade of work but you must pay fair prices. No other condition is possible."

Uses of Unusual Metals

THE business of producing, alloying and manufacturing metals is full of interesting highways and byways, and strangely enough even those who are engaged in it are not always familiar with some of its ramifications. How many brass men, for example, know where quicksilver goes? How many know what cadmium is used for? A short disquisition on these two metals should not go amiss.

Quicksilver is often sold directly by the producer to the consumer. According to the Bureau of Mines, American consumption is about 32,000 to 35,000 flasks (75 pounds each) per year with a market value of about $3,500,000 to $4,000,000. Mercury goes into amalgamation processes for recovering gold; it is used in large quantities in scientific and technical instruments for automatic control methods because of the fact that it is liquid at ordinary temperatures. It is of utmost importance as mercury fulminate for use in blasting compounds and ammunition. It goes into pharmaceuticals, chemical manufacturing processes, neon and mercury lights, pigments and cosmetics, electrical industries, disinfectants, and last, in the very latest power development, in mercury boilers.

Cadmium, well known to the plating fraternity, is a constituent of nearly all the well known alloys employed in fusible plugs for automatic sprinklers, steam boilers and fire alarms and for safety devices in electric circuits. According to Paul M. Tyler, in a report recently published by the United States Bureau of Mines, such alloys usually contain also lead, tin and bismuth. They have a wide range of melting points from 140 degrees F. upward. An antimonial-lead alloy containing bismuth and cadmium has been invented for bonding glass.

Cadmium was formerly used in dental alloys together with mercury, tin and bismuth, but it is no longer in good standing for this purpose. It is still used, however, in stereotype plates. An important use is in copper telephone and trolley wires in proportions of .5 to 1.2 per cent, as it raises annealing temperatures and adds materially to the strength and wearing qualities of copper without greatly reducing its conductivity. Some quantities of cadmium are used to improve the properties of both plated and Sterling silverware, and in the jewelry trade for producing green gold.

A new and most important use is in rust-proofing steel, which has made a great impression, particularly in the automobile industry, but also with nuts, bolts, small hardware parts such as locks, refrigerator trimmings and wire products.

There are a number of other uses which employ small proportions of cadmium such as aluminum powder, cold storage batteries, miners' lamps, monocramatic red light, etc.

Varied and small as these uses may seem, the total is respectable for both cadmium and mercury. It is of special interest to note that the prices of both of these metals have risen steadily in the last year or two.

Lead Poisoning

AS in the case with many other dangers of industry, in lead poisoning, prevention is the important factor, according to the U. S. Public Health Service. It is posible, of course, to cure lead poisoning if the disease is caught in time but it is much easier to prevent it. The responsibility for the prevention of lead poisoning is placed particularly on the manufacturer, but the worker should also be alive to the danger.

Safety measures should be, and in many cases are, provided; they should always be used. The men should be educated to necessity for care and caution and the importance of personal hygiene and habits. Of course, some trades are more subject to this disease than others and for such conditions, the care exercised must be redoubled.

Lead poisoning is one of the oldest diseases of civilization. The Greek, Latin and Arabian physicians knew that lead would produce colic when swallowed. Lead poisoning was common at one time, due to the widespread use of lead as a material for cooking utensils and other household articles. In certain industries of olden times

such as the production of wine, lead was used to promote acid fermentation and consequently caused widespread lead poisoning. Modern trades in which workers are exposed to lead include lead mining, smelting and refining, paint manufacture, storage batteries, enamels and glazes, glass, rubber, varnish, pottery, plumbing, aniline dyes, putty, printing, ink and linseed oil refining.

In general, lead poisoning is evidenced by acute colic. Resistance is lowered and unless the disease is checked it will became chronic, resulting in paralysis. The blood shows changes, the corpuscles being destroyed and anemia follows.

Cures for lead poisoning consist mainly of the elimination of the lead by saline purgatives and strict regulation of the diet, which should be rich in fruits and such foods as contain calcium and vitamins. Lead poisoning in any form should be treated by a physician even if it is only mild.

The best plan is not to be attacked by it at all, but if anyone is exposed to lead in any form, he should view with suspicion attacks of indigestion, no matter how slight. There should be no time lost in consulting competent medical advice.

Standardization

A RECENT editorial in the daily press under the title given above brings to mind the fact that standardization is still misunderstood by a large part of our lay public. To them standardization means the elimination of individuality. It means oppressing the human spirit by making us all wear the same clothes, live in the same houses, eat the same foods and have the same thoughts. Nothing could be further from the truth.

What are the results of the standardization program as carried on by American industry? The following list taken from a publication of the American Standards Association can be quoted verbatim:

1. It enables the buyer and seller to speak the same language, and makes it possible to compel competitive sellers to do likewise.
2. In thus putting tenders on an easily comparable basis, it promotes fairness in competition, both in domestic and in foreign trade.
3. It lowers unit cost to the public by making mass production possible, as has been so strikingly shown in the unification of incandescent lamps and automobiles.
4. By simplifying the carrying of stocks, it makes deliveries quicker and prices lower.
5. It decreases litigation and other factors tending to disorganize industry, the burden of which ultimately falls upon the public.
6. It eliminates indecision both in production and utilization—a prolific cause of inefficiency and waste.
7. It stabilizes production and employment, by broadening the possible market, and making it safe for the manufacturer to accumulate stock during periods of slack orders to an extent which would not be safe with an unstandardized product.
8. By focusing on essentials, it decreases selling expense, one of the serious problems of our economic system.
9. It is one of the principal means of getting the results of research and development into actual use in the industries.

The fact that American industry is trying to concentrate on uniformity in its manufactures seems to frighten those who think in terms of "beauty and light" without accurate knowledge of industrial history. Uniform bathtubs does not mean that we must all have the same bath night. Uniform specifications for textiles does not mean that we must all wear the same colored clothing. Uniform specifications for Portland cement does not mean that we must all live in the same kind of house.

Standardization means the elimination of the useless and the consequent lowering of the cost of necessities. It means the freedom to enjoy luxuries which have been hitherto reserved for the wealthy. It means, in the long run, the opportunity for greater leisure and freedom.

Aluminum Poisoning

FROM time to time one hears of the possibility of poisoning or the development of diseases as a result of materials which are used for food containers. We had brought to our attention a number of scattered pieces of literature pointing out that aluminum was the cause of stomach disorders, such as indigestion, ulcers and even cancer. In a general way we traced this information and found that most of it emanated from Dr. Charles T. Betts, a dentist, of Toledo, Ohio.

Other opinions were obtained in order to get a perspective on this subject.

The upshot of our own investigation was that there was little if any recognized agreement with Dr. Betts, at least in the literature. Most of the experiments made by him are unscientific and inconclusive in character. We quote as follows from two indisputable authorities:

"While we have no specific studies on the effect of aluminum utensils on foods prepared therein, articles by independent investigators have appeared in the literature giving the results of studies of the action of foods on aluminum. It is generally agreed that an action is detectable, especially with strongly acid and alkaline foods, and some metal will pass over into the food. It is believed, however, that aluminum in the quantities found in the food under such circumstances is not of a magnitude large enough to produce a deleterious effect on the health of persons consuming this food."

* * *

A late published work on the subject of metals in our food is that of Flinn and Inouye, published in the Journal of the American Medical Association for March 31, 1928, page 1010. The authors point out that "we have been asked many times during the past year whether we thought aluminum cooking vessels had any effect on the health. These inquiries have been brought about by published discussions of the subject, many of which are unscientific and unsupported by facts. Without projecting ourselves into the 'alum' discussion, we must admit that our observations do not confirm some of the published statements . . . A study of the growth curves, the blood and animal behavior and a pathological examination of the tissues indicates that persons do not suffer any ill effects from the small amount of metals present in the food or dissolved from the cooking vessels . . . There is no scientific evidence of any chronic poisoning taking place from food cooked in aluminum utensils. Large doses of aluminum salts, like copper and nickel, will cause gastro-intestinal disturbances when excessive amounts are dissolved."

The most generally accepted conclusion about the effect of aluminum and aluminum compounds on the human body may be summarized by the following abstract from an article in the Journal of Biological Chemistry for May, 1928, "A study of the Possible Role of Aluminum Compounds in Animal and Plant Physiology," by McCollum, Rask and Becker.

1. Aluminum is not a constituent of either plant or animal matter.

2. Aluminum compounds are not absorbed out of the stomach or intestinal tract when present in the diet.

3. Aluminum compounds when present in the alimentary tract do not form any union or compound with the stomach or intestinal walls.

4. Aluminum compounds in the diet in concentrations as high as 600 p.p.m. of the element aluminum exert no noticeably deleterious action on growth, reproduction or general well being as judged by external appearance and autopsy.

These conclusions may, perhaps, not be regarded as final until after additional and confirming data have been obtained on a larger variety of materials and other animals. But until then there seems to be no other alternative than to accept them as tentative.

Correspondence and Discussion

Electro-Deposition of Non-Metallics

To the Editor of THE METAL INDUSTRY:

I wish to express my appreciation of the article "Electro-Deposition of Non-Metallic Materials," appearing in your August issue, which was of especial interest to me because of the fact that I have been aware for more than thirty years such materials could be electro-deposited. However, not until reading this short but excellent article was I aware of the real scientific reasons that cause their deposition on either pole or both.

In my early days at the trade, everything was shrouded in mystery and secrecy as much as possible by the foremen; so everything I learned I had to teach myself by experimentation, and I learned a lot; in fact, I believe I learned more than some of them ever knew, and in looking back at the past I believe a good deal of that mystery was used as a cloak for a lack of knowledge.

Whenever I felt moved by the experimental urge, I would electrolyze any kind of a solution that suggested itself to me, just to find out what it would do. I would also add outlandish substances to small quantities of plating solutions to see whether they would be beneficial or harmful and later, after I became a subscriber to THE METAL INDUSTRY, some twenty-odd years ago, it was with no little pride and satisfaction that I occasionally read articles, written by men of real scientific training and education, on the subject of colloidal substances in plating solutions and their effects on the deposits. My pride and satisfaction were due to the fact that I, in my own crude, dumb way, had acquired a previous working knowledge of some of the things I read about.

I do not remember all of the experiments I made with non-metallic materials. However, I do remember that at the time I thought some of them might have possibilities.

I remember that linseed oil in a solution of caustic soda will, upon electrolysis, deposit, if I remember aright, on the positive pole. Using plates of sheet brass, a brownish gummy film, like skin-dried paint or oil, would form in a few seconds on one of them and then deposition would cease because the plate would become insulated.

I wondered at the time if an endless sheet anode or cathode passing through a solution and out over rollers so that it could be mechanically scraped as it emerged, could not be used for the production of an oxidized oil, but lack of facilities and wherewithal always hampered me.

Extract of logwood dissolved in carbonate of soda solution will, upon electrolysis, deposit its coloring matter simultaneously at the anode and cathode as a purple flocculent powder insoluble in water but soluble in weak acid or alkali with a red or purple color, respectively. It must be at least thirty-seven or thirty-eight years since I made that experiment, but I remember it perfectly.

Several times I added extract of logwood to a soda lead solution such as is used for making iridescent colors, and sometimes the oxide film would deposite jet black and at others an even purple.

Some of the water-soluble aniline dyes can also be electro-deposited from their solutions; the only one I remember at present is aniline green. The deposit was smooth and apparently underwent no change and was soluble in water.

Crystals of carbolic acid dissolved in strong ammonia would, upon electrolysis, form heavy brownish drops that would drop from one of the electrodes to the bottom of the glass where they would cohere and when taken out would be a dark gum or resinous-looking substance devoid of some of the properties of carbolic acid but with others newly acquired.

I also noticed that strong soap solutions would deposit their fatty constituents electrolytically, some of them rising to the surface briskly like thick curds.

That is about all I can recall, and in conclusion I want to say that I also got a great "kick" and big laugh out of "At War With the World." I have not done any plating for about ten years and in all probability will not do any more, but I continue to take your paper just to keep abreast of the times in an industry I followed many years of my life.

I think your disgruntled subscriber is taking the wrong attitude. Knowledge is power and you never can tell when real information, no matter on what subject, will prove to be of value.

Louisville, Kentucky
August 19, 1929.

R. A. LANGERMAN.

Appreciates Chromium Information

To the Editor of THE METAL INDUSTRY:

Thank you for the copy of your convention issue which we received this morning. We follow your articles in THE METAL INDUSTRY with keen interest and recognize the work you are doing as a pioneer in the field of chromium.

Philadelphia, Pa.,
August 13, 1929.

MERCK AND COMPANY, INC.,
C. W. Backus.

Technical Papers

Corrosion of Metals—Surface Film Protection, by F. N. Speller. An abstract of a Paper Presented at the New York Meeting of the American Association for the Advancement of Science, December 1928.

The electrochemical theory of corrosion is now generally accepted in explanation of the initial corrosive attack at normal temperature. At higher temperatures and occasionally at temperatures not far above normal, direct chemical attack may occur.

In case corrosion products are insoluble, surface films form which greatly retard and sometimes stop the reaction. The metal surface may thus become completely covered with a film of corrosion products.

Certain inhibitors reduce the rate of solution of metals in acid solutions. It has been shown that this is due to an increase in the hydrogen overpotential which is generally assumed to be due to the formation of a film of discharged inhibitor substances absorbed on the cathodic areas.

In domestic water supply, the pH can be controlled, resulting in the formation of a protecting layer of calcium carbonate. Sodium silicate has also been found useful in some waters.

Metals may be made passive to corroding reagents by the use of specific chemicals either to produce protective films or, as stated above, to act as inhibitors.

The author discusses various metals resistant to corrosion.

The Production and Properties of Magnesium Alloy Castings. By E. Player. A lecture before the Birmingham Metallurgical Society, December 13, 1928.

This is a complete summary of the present day situation in magnesium alloy castings, particularly the type known as Elektron. The author covers the history of magnesium; methods of application; chemical properties; composition of Elektron alloys; physical properties of Elektron castings; foundry practice; protection against corrosion; die castings; applications of Elktron castings; sheet metal, etc. He tells in his conclustion that the final perfection of these alloys has not yet been reached, but a solid technical foundation has been laid upon which future development can be safely built.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN, A. B. W. J. PETTIS
W. J. REARDON P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE
WILLIAM BLUM, Ph. D. A. K. GRAHAM, Ph. D.
G. B. HOGABOOM WALTER FRAINE

Cadmium Solution Defects

Q.—I am sending under separate cover a sample of cadmium solution used in a barrel plater. This solution gives satisfactory deposits while new but as it is used the resistance increases until practically no metal will deposit.

This was made up as follows:

Cadmium oxide	3 oz.
Sodium cyanide	7 oz.
Caustic soda	2 oz.
Dextrine	1 oz.
Water	1 gal.

Can you suggest a remedy?

A. Analysis of cadmium solution:

Metallic cadmium	5.48 oz.
Free cyanide	2.60 oz.
Caustic soda	1.30 oz.
Carbonates	2.65 oz.

Solution is high in metal and low in free cyanide. We recommend that you take one-third of the solution out of the tank and replace it with water, then add 6 oz. of sodium cyanide to each gallon of solution.

Take one-fourth of the cadmium anodes out of the solution, also, and replace with steel anodes. When solution is not in use, take the cadmium anodes out of the tank.

—O. J. S., Problem 3,881.

Choosing Silver Solution

Q.—We are contemplating changing our silver solution for lighting fixtures and would be pleased to hear your opinion as to what would be the best type of solution.

A.—In making a new silver solution, it is well to consider which type of solution to install. Both the chloride and the cyanide types of bath have their merits.

If a white, chalky deposit is wanted, we would recommend the chloride bath. If a finer grained deposit is required and the finish produced is to be polished, we would prefer the cyanide bath. The cyanide type of bath is most generally used and we believe that you will find it more suitable for your class of work.

Formula for cyanide bath:

Silver cyanide	4 oz.
Sodium cyanide	7 oz.
Ammonium chloride	½ oz.
Water	1 gal.

Current density, 4 to 5 amperes per sq. ft., with 1 volt.

Why discard your present solution? If it is not operating satisfactorily, perhaps it can be improved if you will send us a sample for analysis.

—O. J. S., Problem 3,882.

Chromium on Small Jewelry

Q.—I am seeking information on chromium plating of small articles such as jewelry, rings, brooches, etc. I have tried a solution composed of chromic acid, 32 oz.; chromic sulphate, 1 oz.; boracic acid, ¾ oz.; water, 1 gallon. I used lead anodes and also steel, but had little success with either. The articles plate very heavily near the bottom of the tank while those near the top where the wires are tied do not plate at all. The plate is a dull grey, with actual treeing toward the bottom. I am using a 2-quart glass jar to hold the solution, operate a "World" generator, the capacity of which I do not know as I have no ammeter. The solution is used at 100 to 115 degrees.

A.—Successful chromium plating requires a more careful control of certain factors than is necessary for the deposition of more common metals.

Temperature, current density, metal concentration and sulphate content are the most important factors to be considered and they must be controlled within certain definite limits if satisfactory results are to be obtained.

The following solution will give good results:

Chromic acid	55 oz.
Sulphuric acid	0.3 oz. by weight
Water	1 gal.

Temperature, 95° to 100° F.; 50 to 75 amperes per square foot. Use lead anodes.

—O. J. S., Problem 3,883.

Faults in Plating Practice

Q.—Some trays and tea sets made of white metal are giving us spotting-out trouble in plating, which we believe is through the fault of the metal. We are enclosing under separate cover a sample of our silver solution which you will kindly analyze for us and maybe you might find the trouble due to the solution.

We are also enclosing a sample of one of the baits which we are finishing in nickel and gold. We find that when gold plating it blisters the nickel. We are using our gold solution at a temperature of 150° to 160° Fahrenheit. Our gold solution is composed of:

Water	1 gallon
Phosphate soda crystals	9½ oz.
Bisulphite soda	1½ oz.
Sodium cyanide	½ oz.
Chloride gold	120 grains

Do you know of any other gold solution which we could use cold to give us this 24 karat finish? Our solution evaporates very quickly using it at that temperature.

A.—Analysis of silver solution:

Metallic silver	1.43 oz.
Free cyanide	2.90 oz.
Chlorides	4.64 oz.

The metal content of the solution is low. We suggest the addition of 1 oz. of metallic silver to each gallon of solution. Dissolve the metallic silver in C. P. nitric acid and a very small quantity of water on a hot water bath. Precipitate the silver by adding a saturated solution of sodium chloride. Wash precipitate several times with water and then add enough sodium cyanide to dissolve the precipitate.

Your trouble of "spotting out" is undoubtedly due to character of the metal being plated. We do not believe that the blistering of the nickel deposit when gold plating is caused by the gold plating operation, but that it is due to the condition of the nickel solution or the method of cleaning the work before nickel plating.

If you increase the sodium cyanide content of the gold solution ½ oz. per gallon, you will probably be able to reduce the temperature somewhat. All cyanide gold solutions for the class of work

you are doing are used warm. The following formula will give good results:

Gold as fulminate	5 dwt.
Potassium cyanide	1 oz.
Sodium phosphate	1 oz.
Water	1 gal.

Temperature, 120° to 140° F.

—O. J. S., Problem 3,884.

Greens and Browns on Copper

Q.—Please let me have your suggestion regarding a formula to produce a pale or dark green copper as on window frames or such articles having the finish commonly known as the "antique copper effect."

What method is employed to produce the deeper, darker, coppery color which comes from long exposure to weather? It is a dull color, browner than that of copper itself.

A.—In general, most of the green finishes that are seen on wondow frames and store fronts are pigment finishes. The pigments, which are ground in japan, are thinned with turpentine to the right consistency, painted on, and relieved with a cloth moistened with turpentine.

The chemical method of producing a green effect on copper is as follows:—dissolve 8 oz. white arsenic and 8 oz. copper carbonate in 1 quart hydrochloric acid with the aid of heat. Next, dissolve 1 pound copper acetate in 1 quart water, and 2 pounds ammonium chloride in another quart of water. Mix the 3 solutions together and paint on work.

A deep brown color can be produced on copper in the following solution:

Yellow barium sulphide	1 oz.
Water	1 gal.

Temperature, 140° F.

—O. J. S., Problem 3,885.

Nickel and Silver Solutions

Q.—We are mailing you under separate cover some samples of our nickel and silver baths. We have recently taken over a plating plant and our desire is to learn whether the contents of these solutions are correct. We are having trouble with the present nickel bath in that the deposit is thin and quite readily peels. Our silver bath seems to give a brittle deposit which will not stand buffing, and the color is a gray instead of a cream color.

The nickel tank has 270 gallons and the silver bath has 35 gallons.

Would you kindly advise us how to adjust our difficulties so that we will be able to get satisfactory results for jobbing work.

A.—Analysis of nickel solution:

Metallic nickel	2.48 oz.
Chloride as ammonium chloride	2.48 oz.
pH.	5.2

Analysis shows solution to be high in acid. Add to the 270 gallons of nickel solution, 18 ounces of 26° Ammonium hydroxide.

Analysis of silver solution:

Metallic silver	1.29 oz.
Free cyanide	1.17 oz.

Solution is low in metal and free cyanide. Would advise the addition of one ounce silver cyanide and 2½ ounces of sodium cyanide to each gallon of solution. Keep cathode current density low by using 1 volt pressure.

With the solution as it is, can see no reason why the deposit should raise when buffed, if the work is properly cleaned and struck in the silver strike before silver plating.

—O. J. S., Problem 3,886.

Nickel on Die Castings

Q.—We are sending you under separate cover a sample of nickel solution to be analyzed. This solution has been used for several months to plate directly on zinc die castings. The edges and points of the castings burn and there is deposit in the recesses. The solution also has a tendency to pit.

Please give us a complete analysis of the chemical contents and the amount of zinc suspended, and also advise what we should add to bring this solution up to the highest point of efficiency possible.

A.—Analysis of nickel solution:

Metallic nickel	2.53 oz.
Chloride, as ammonium chloride	3.97 oz.
pH	6.8
Zinc	trace

The amount of zinc the solution contains is not the cause of your trouble. We suggest the addition of 3 oz. sodium chloride and 1 oz. sodium citrate to each gallon of solution.

—O. J. S., Problem 3,887.

Nickel on Toy Pistols

Q.—We are sending you by parcel post some toy pistol castings. We wish some advice as to the best method of putting a thin bright nickel plating on these castings. At the present time we are tin plating, but the result is not satisfactory.

A.—Castings should be pickled in a hydrofluoric acid pickle consisting of 1 part acid to 4 parts of water, used warm, to remove the sand; burnished with steel balls to produce a smooth bright finish, and then plated in a plating barrel with the following solution:

Double nickel salts	10 oz.
Single nickel salts	5 oz.
Sodium chloride	3 oz.
Cadmium chloride	½ oz. to 100 gallons of solution
Water	1 gal.

—O. J. S., Problem 3,888.

Plating White Gold on White Gold

Q.—Please give me a good solution for white gold plating to make actual white gold look whiter. I have tried a number of formulas but do not find one satisfactory.

A.—A white gold solution, if made and operated properly, should produce a good white deposit. The proper method of making a white gold solution is to run the gold into solution by the porous pot method. White gold deposits have a tendency to tarnish; to guard against tarnishes, the work is flashed in a tin solution made of the following:

Tin chloride	¼ oz.
Sodium cyanide	1 oz.
Water	1 gal.

Operate at 140° F.; with 2 to 3 volts.

—O. J. S., Problem 3,889.

Silver Solution for Job Work

Q.—Please give your opinions on the following questions:

Which do you consider the best for all around job plating, a silver solution made with cyanide or one made with chloride?

What is the best way to clean pewter before silver plating? I do not wish to use an electric cleaner. I use a still cleaning tank. Is it better to plate pewter with nickel before silver plating?

A.—For general job shop work, would recommend a silver solution that is made as follows:

Silver cyanide	3 oz.
Sodium cyanide	6 oz.
Ammonium chloride	1 oz.
Water	1 gal.

To replate britania or pewter metal the old silver should be stripped off in a cyanide strip as follows:

Sodium cyanide	10 oz.
Water	1 gal.

Use reverse current and agitate solution or the work.

After stripping place in muriatic acid pickle for few minutes to soften oxide, wet scratch brush, polish, then clean in your alkaline cleaner, and scrub with lime or pumice depending upon finish to be produced, strike in regular silver strike and plate in silver solution.

—O. J. S., Problem 3,890

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,714,879. May 28, 1929. **Process for Removing Enamel.** Harry O. Lang, Pontiac, Mich.

A process for removing non-vitreous enamel from a metallic base consisting in immersing the enameled article in a bath of a molten material comprising principally an alkali metal salt of nitric or nitrous acids.

1,715,362. June 4, 1929. **Buffing Wheel.** Edward S. Herberg, Astoria, N. Y., assignor to Barker Bros., Inc., a Corporation of New York.

In a buffing wheel the combination with a pack of concentric circular disks of flexible absorbent fabric material, of concentric facing disks of smaller diameter on each side thereof formed of fibrous flexible material adapted to absorb a stiffening medium, a ring of fastening means through all of said disks drawing said disks snugly together along the line of the fastening means and extending around the axis of the wheel at a distance from the centre, and a hardening stiffening medium absorbed in the absorbent materials of said disks and forming a tough hardened circular core within and extending to said fastening means, the portion of the fabric and fibrous disks beyond said core being uniformly flexible.

1,715,411. June 4, 1929. **Electroplating Rack.** Nicholas Phillipp Di Cesare, Sheboygan, Wis., assignor to Kohler Company, Kohler, Wis.

An electroplating rack comprising a cathode frame, an anode frame detachably connected therewith, said cathode frame including horizontal cross rods one above the other and each cross rod containing a row of supporting rings, and said anode frame including vertical anode carriers, each with a vertical row of hook-shaped anodes extending through the supporting rings.

1,715,589. June 4, 1929. **Rust-Loosening Composition.** Frank M. Boynton, Philadelphia, Pa.

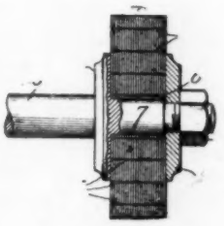
A rust penetrating composition which consists of tetrachlorethane and liquid hydrocarbons having a boiling point within the range of that of varnolene and kerosene, said composition being more than half tetrachlorethane, and said liquid hydrocarbons being more than half varnolene.

A rust penetrating composition which consists of tetrachlorethane about 55 per cent and varnolene 35 per cent and kerosene 10 per cent.

1,716,050. June 4, 1929. **Manufacture of Alloys.** William M. Grosvenor and Victor P. Gershon, New York, N. Y.; said Gershon assignor to said Grosvenor.

A material containing zinc, nickel and copper alloyed together, the material containing about 20% of zinc, about 70% or more of nickel and copper in any amount up to 9%.

1,716,056. June 4, 1929. **Buff.** George B. Hogaboom, New Britain, Conn.



A buff wheel comprising a plurality of disks of fabric, the warp and weft threads of the fabric disks being equal in number.

1,716,590. June 11, 1929. **Non-ferrous Welding Rod.** Arthur R. Lytle, Elmhurst, N. Y., assignor to Union Carbide & Carbon Research Laboratories, Inc., a Corporation of New York.

A welding rod containing copper, zinc and silicon; the sum of the copper and zinc contents being at least 82.5%; the copper content falling within the range 55% to 65% and the silicon content falling between 0.01% and 4%.

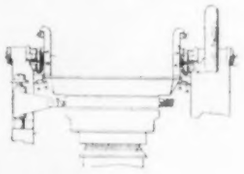
1,716,599. June 11, 1929. **Mechanically-Worked Zinc Product.** Willis M. Peirce and Edmund A. Anderson, Palmerton, Pa., assignors to The New Jersey Zinc Company, New York, N. Y.

As a new article of manufacture, a mechanically worked zinc product made of a zinc base alloy substantially free of aluminum and containing not less than 92% of zinc, from 0.005 to 0.5% of magnesium, and from 0.05 to 5% of copper.

1,716,943. June 11, 1929. **Aluminum-Beryllium Alloy and Method of Treatment.** Robert S. Archer and William L. Fink, Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

The method of treating an aluminum base alloy containing beryllium, which comprises heating the alloy to a temperature slightly below the melting point of the aluminum-beryllium eutectic to cause substantial solution of the undissolved beryllium constituent of the alloy, and thereafter quenching the alloy from substantially said temperature.

1,717,119. June 11, 1929. **Molding Machine.** John T. Ramsden, Philadelphia, Pa., assignor to The Tabor Manufacturing Company, a Corporation of Pennsylvania.



In a molding machine having a support and a table and means for turning and means for raising and lowering the table in respect to the support, a trunnion structure comprising the combination of a tongue and groove clutch element for turning the table and for affording it freedom for rising and falling movements, and of three rolls arranged in the lower segment of an arc of a circle and a drum adapted to seat and to turn on said rolls and to be raised and lowered through the space above them.

1,717,140. June 11, 1929. **Lead Coating of Articles.** Oscar Brandenberger, Zurich, Switzerland, assignor to Zahner & Schiess & Co., St. Gall, Switzerland.

A paint for applying a lead coating to articles, consisting essentially of finely subdivided metallic lead and a binder, and having incorporated therein finely subdivided metallic antimony for preventing oxidation of the lead.

1,717,460. June 18, 1929. **Apparatus for Electroplating Metallic Bands.** Joseph J. Mascuch, East Orange, N. J.

In an electro-plating apparatus for strip stock as described, the combination, a plating vat, an integral frame of insulating material having a top bar and a bottom bar, said top bar engaging the upper edges of the vat and holding the lower bar suspended in the vat, a row of rollers on the upper bar and a row of rollers in aligned relations supported by the lower bar, the stock to be plated being passed alternately between the upper and the lower row of rollers and a pair of rollers on the upper bar for engaging said stock between said rollers.

1,717,468. June 18, 1929. **Electroplating Process.** Louis Schulte, Pittsburgh, Pa., assignor to Allegheny Steel Company, Brackenridge, Pa.

The method of obtaining deposits of cobalt chromium alloys on a ferrous base, which consists in passing an electric current through a bath in which the articles to be coated are immersed, said bath containing a mixture of the following solutions in which mixture the chromium solution predominates; one of said solutions being made up in substantially the following proportions:—50-75 grams cobalt sulphate, 30-40 grams sodium sulphate, 5-15 c. c. of hydrofluoric acid in about 250 c. c. of water; the other solution being in substantially the following proportions:—75 grams chromic acid, 3 grams caustic potash 10 c. c. of commercial hydrofluosilicic acid in about 250 c. c. of water.

1,718,378. June 25, 1929. **Method of Producing Zinc.** Augustin Leon Jean Queneau, New York, N. Y.

In the production of zinc, the method which includes subjecting zinc oxide to the action of a fluid reducing agent while the oxide is held in a molten bath.

Equipment

New and Useful Devices, Machinery and Supplies of Interest

Aluminum Polishing

By A. ROUSSEAU

The Norton Company, Worcester, Mass.*

Aluminum articles are usually made by one of three different methods:

a) Cast in sand.

b) Die cast in moulds.

c) Formed from sheets in power presses.

Practically all aluminum articles are polished. The metal is soft and ductile and is easily cut but in many instances sand or small pit holes must be removed. This is done by polishing with an abrasive.

Each type of article presents a different problem and the ultimate finish desired must receive consideration according to the particular article.

It is a loss of time to use abrasive either too fine or too coarse for roughing, when a high finish is desired. Time gained in roughing, using coarse abrasives, will be lost on the following operations in removing the coarse roughing marks; too fine grain sizes reduce the rate of production and at the same time do not give a materially better final finish.

On heavy castings, where considerable metal is removed, the first roughing operation can be successfully done with No. 60 Alundum abrasive set up on a sewed buff, felt or canvas wheel. The sewed buff is the more resilient and follows the shape of the work best, and should be used for round or formed work.

Sand cast pieces, with small pit holes and rough exteriors are most successfully roughed with a greased wheel of not coarser than No. 60 Alundum grain.

After roughing with No. 60 the next operation can be made with No. 90 or 100 depending upon the finish desired. There are some instances where an additional operation is necessary. In such cases wheels set up with No. 180 or No. 200 are used.

On die cast pieces which are fairly smooth from No. 90 to 150 or 180 Alundum abrasive can be used.

The polishing of sheets is readily done on a felt wheel set up with No. 180 Alundum and buffed with a felt wheel which gives a much better finish than a cotton buff. On sheets and flat work it is advisable to change the direction of the strokes when changing from one size to the next finer. This will facilitate the obliteration of the scratches left by the coarser grain. Many sheets on which only the press marks must be removed can be polished directly with a buffing wheel using Tripoli for the polishing agent. No coarser abrasive is necessary in this instance.

On work that is painted instead of buffed, the uniformity of the grain is most important. This is especially true of work finished in lacquers of a light finish. Oversize grain will not break down but will leave its mark on the surface which is very easily distinguishable.

Successful finish or polish depends chiefly upon two points. First, the care that is used in preparing the article for the final buffing and second, a plentiful supply of grease, tallow or some other lubricating agent used on the polishing wheels.

All roughing scratches must be removed in the fining operation. Work not properly finished on the fining wheel comes from the buff wheel with a high color but rough appearance. This is caused by the buff wheel dragging in the scratches and making them deeper.

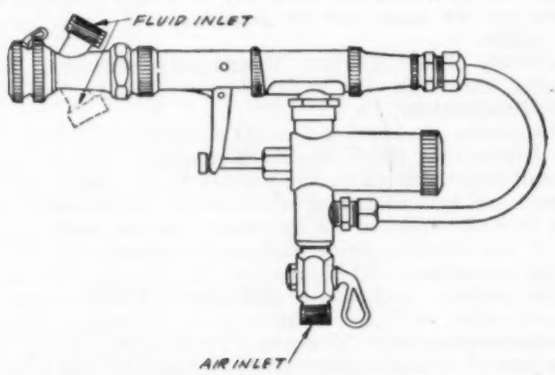
The use of plenty of grease on all of the operations in the polishing of aluminum will mean a much better eventual finish. If a wheel becomes too dry it matters little what size abrasive is used for it will imprint marks as deep as the amount of metal load on its face. Grease sticks sold by platers' supply houses, beef tallow, suet, kerosene, or an oil rag applied to the wheel reduces loading and dragging of the work and at the same time improves the quality of the finish for the final or buffing operation. If plenty of lubricant or grease is not used, the buffing operation is harder on the buffing wheel and there is a possibility of the buff dragging the pits and holes, making a poor finished casting.

In obtaining the final finish Tripoli is sometimes applied on the buff wheel to help cut the metal and obtain what is termed the "Bottom." After the Tripoli, a silica compound may be used to remove buffing marks and give color. Where a high color is desired, lime and rouge are sometimes employed.

*From Grits and Grinds, December, 1928.

New Type Automatic Airbrush

A new type of automatic airbrush for application in coating processes on any products with any type of coating material, ranging from lightest stains to plastic compounds, is announced by the Paasche Airbrush Company, Chicago, Ill. The new mechanism is a unit from which fifty or more airbrushes can be operated, as required, the makers state. The airbrush can also be operated as a single spray. The company gives the following advantages:



Automatic Airbrush Control Unit

Complete enclosure of all parts, preventing clogging and eliminating wear; time and labor-saving features due to automatic operation by one person of a battery of spraying heads.

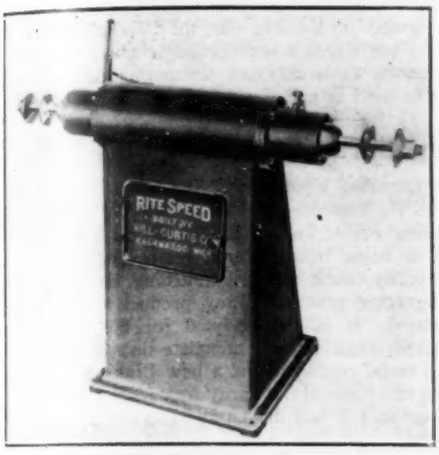
Protective Lacquers

What is claimed to be a new invention in lacquers has been placed on the market by the General Electric Company, through its Merchandise Department, Bridgeport, Conn. The new type of coating material, marketed under the trade name "Glyptal Lacquers," is said to have unusual characteristics in that it will adhere to any surface, including galvanized iron and aluminum and that it will act as a sealing agent and protective as well as decorative coating. The makers state the lacquers were developed in the General Electric research laboratories and that they differ from commonly used paints and varnishes, being unusually resistant to mineral oils, gasoline, kerosene, weak acids and alkalies.

The lacquers are supplied in several colors, all having the same general properties of protection, decoration, adhesion, etc. The lacquers are stated to be applicable by spraying, brushing or dipping, the usual methods. They air-dry rapidly and smooth, flexible finishes of high dielectric strength are produced. Among its uses is stressed its efficacy as a sealing agent for oil, gas and water conveying equipment. The company offers test strips and information upon application to the Bridgeport offices.

Electric Polisher and Buffer

A new type of electric polishing and buffing lathe has been added to the "Rite-Speed" line manufactured and marketed by the Hill-Curtis Company, Kalamazoo, Mich. The new machine, shown in the illustration is furnished either as here pictured



New Type Polishing and Buffing Lathe

or with the overhanging type of spindle. Its chief feature, the makers state, is the ease with which the multi-V type belt which furnishes power to the spindles can be removed. This is accomplished by removal of four cap screws on each side of the spindle, which is then entirely removable from the pedestal without disturbing the bearing mounting, loosening motor adjustment screw to release tension on the belt and slipping out the belt. It is stated that in other respects as well the machine has been constructed to permit continuous service, ease of control and simplicity of operation with minimum attention.

The machine is furnished with combination switch and brake, a new feature on all Hill-Curtis polishing machines. By pulling the lever forward the current is cut off and the brake applied; reversing this operation starts the machine. Adjustment of belt such as tightening is done from outside without disturbing motor mounting. Motor is mounted in the pedestal. Timken tapered roller bearings or ball bearings are supplied according to specification. Automatic motor starter with overload protection is standard equipment.

Tin Compound to Prevent Rust

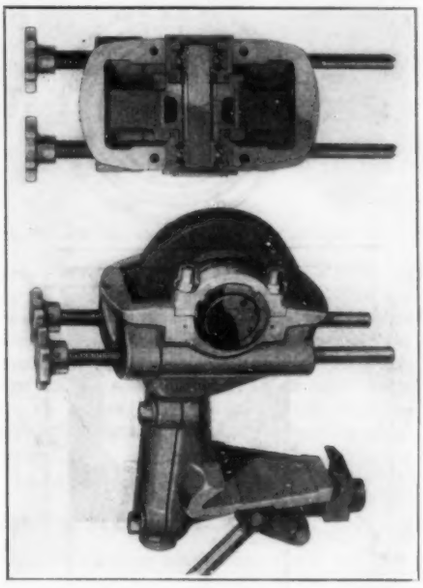
The development of a tin compound which, it is claimed, will prevent corrosion of ferrous metals is announced through Doremus & Company, New York City, bankers. The new compound is said to have been developed by a Canadian scientist and tested by the National Physical Laboratory of Great Britain, where, it is said, it was found effective as a rust preventive. The compound, a grayish powder, is sprinkled on the corroded surfaces of heated ferrous metals, the process causing the rust to "boil out" and leaving also a "perfectly tinned surface." It is stated that the substance has been marketed in Great Britain with great success, it having been adopted for use by the British Admiralty, Air Ministry, Woolwich Arsenal and a number of concerns, including the London Electric Railways, the Great Western Railway of Brazil and the British Columbia Electric Railway Company.

The ingredients of the preparation, it is stated, are secret. It is known to contain a high percentage of tin, according to the statement by the New York banking firm, and the tests made are claimed to have shown it to be effective in tinning rusty cast iron and steel as well as such metals as phosphor-bronze, manganese-bronze and "Ohmal." The metals, it is claimed, need no cleansing before the tinning operation. "The method employed," says the National Physical Laboratory report, according to the banking firm's announcement, "consisted in heating the metal in a gas flame to a temperature judged sufficient, when the preparation of tin is sprinkled over the area to be tinned. The powder evolved fumes appeared to melt and rapidly produced a continuous 'tinned' surface." The names of the inventor or distributing agency are not given.

Truing Tool for Cylindrical Grinders

Greater increased bearing life, higher operating accuracy and a number of other advantages resulting in marked reductions in wheel-truing costs are claimed for a new dresser for cylindrical grinding machines recently introduced by the Ross Manufacturing Company, Cleveland, Ohio.

The hub design of the new tool is a radical departure from previous ball-bearing types. Permitting the inner, instead of the outer, races to revolve, it attains a 40 per cent decrease in ball speed, an innovation that adds materially to the life of the bearings. Larger balls and "precision exact" machine tool bearings mounted in hardened and ground steel cages are said to give 60 per cent more load-carrying capacity. Bearings are of the closed type, avoiding initial loads and the necessity for adjustment by the operator. One bearing is fixed while the other floats, with the object of eliminating internal strains. The distance between bearing centers is doubled to reduce the leverage of thrust loads of the grinding wheel against that of the dresser, preventing "rocking" of the dresser wheel while in operation and assuring more accurate and uniform results. The hub axle is made in one piece to gain freedom from vibration and distortion under load.



Emery Wheel Truing Tool

Four washers, two of felt and two of specially treated cork, are employed to seal the bearings against grit and water. The edges of the grooved circumferences of the cork rings flex and form an air gap and water seal with the hub. Being lubricated with the bearings, the washers are said to outlast them.

A feature emphasized by the manufacturers is that dresser wheels may be replaced without disturbing the bearing assembly of the tool, since the wheel mounting and bearing assembly are integral. This is done quickly by removing four hollow head nuts that secure the two bearing caps. The tool has two adjustable steady-rests, giving three-point support and enabling tilting to any desired shearing angle. This takes most of the load from the dresser clamp and rigidly supports the dresser wheel close to the work. To gain light weight the holder and bracket of the tool are of Lynite, said to absorb vibration and to have greater tensile strength than cast iron.

New High Temperature Metal

Development of a new metal known as "Konel," which is credited with being much stronger than other metals at high temperatures and which can be used extensively in the moving parts of internal combustion engines and other extremely hot places, has been announced by officials of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. The announcement followed the granting of foreign patent rights.

Originally developed by the Westinghouse research laboratories as a substitute for platinum in the manufacture of filaments for radio tubes, the new metal was discovered to be harder to forge

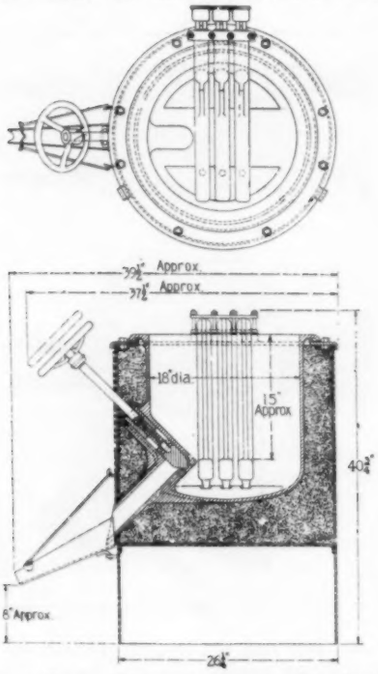
than steel, and to be very tough at high temperatures, when most metals lose their strength. Engineers predict many uses for Konel.

The new metal was created by Dr. E. F. Lowry, a graduate of Ohio State University. As a substitute of platinum, Westinghouse officials are authority for the statement that Konel already is saving approximately $250,000 monthly in the manufacture of radio tubes.

Platinum costs approximately $180 per ounce, while the new substance costs only a few dollars a pound. Life of Konel filaments is approximately ten times longer than other filaments. Tubes with filaments made of the new metal are operated 175 degrees colder than tubes with platinum filaments but with the same emission, thereby giving better reception results, research engineers say.

Melting Pots with Bottom Pouring Spout

The General Electric Company has announced an electric metal melting pot, Type RP, Form F, with a bottom pouring spout. The bottom pouring feature is particularly applicable in cases where it is impractical to ladle and where large quantities of metal are handled. It should find particular favor in the printing industry for the remelting and repigging of type metal, and



Plan and Vertical Section of Electric Melting Pot with Bottom Pouring Spout

(Diagram, courtesy G. E. Co. News Bureau)

in railway shops and automotive factories for the casting of babbitt bearings. It is designed for melting lead, babbitt, tin, solder, type metal and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 950 deg. F.

Automotive control consists of an automatic control panel and a temperature control instrument. Manual control is not recommended.

The advantages of the redesigned pot, as pointed out by the manufacturer, are:

1. Heat is generated right in the metal, affording quick heating and low radiation loss.
2. Heating units are easily replaceable without interrupting production.
3. The maximum rate of heating is obtained without overheating.
4. The pots are reliable, safe and economical.

Armored Cables of Large Diameters

Power and control cable with interlocked, flexible metal armor for installation without a conduit in central station, industrial and other interior wiring has been announced by the General Electric Company, Schenectady, N. Y. Cable provided with the armor can be run along walls, between partitions and under floors without the use of ducts, and the construction of the armor is such that turns in the cable can be made easily, it is stated.

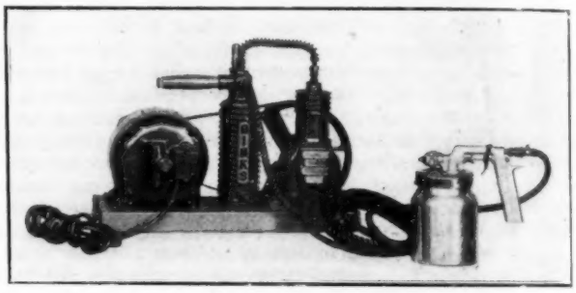
Varnished cambric and rubber-insulated, either taped, braided or leaded, and paper-leaded cable with the armor can be supplied in lengths up to 1,000 feet for cables with an overall diameter less than one inch, and in lengths up to 2,000 feet for cables with an overall diameter between one and three inches. The cables can have any number and combination of conductors, and any outside diameter up to three inches.

The armor is a layer of overlapping and interlocking metal tape, either galvanized steel or aluminum, so applied that the cable is always mechanically protected under reasonable installation conditions. The steel armor is suitable for most installations; the aluminum tape is for use where a non-corroding armor is required and for single conductor cable carrying alternating current where the magnetic effect of steel is undesirable.

New Spray Painting Unit

The Binks Manufacturing Company, 3114 Carroll Avenue, Chicago, Ill., announces the completion of an all-purpose utility spray painting and finishing outfit, known as the Binks New Hurley Unit. This outfit is being manufactured on a large production basis for general utility work such as touching up, refinishing, repainting, and lacquering practically any product within an organization, it is stated. It is also adapted for the spraying of insecticides and disinfectants. It is a complete unit equipped with a full size quart all metal container and a new Binks pressure cup spray gun supplying an atomized flat spray four inches in width.

The air compressor unit is belt driven and connected to a ¼ hp.



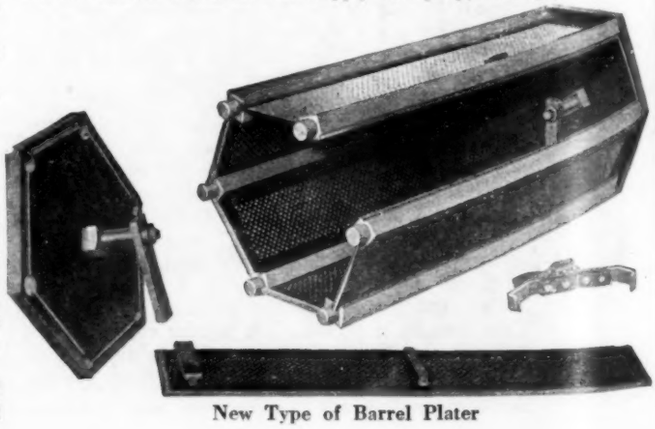
Spray Painting Unit

General Electric motor. This unit has a capacity of 2.16 cubic feet of air per minute. The outfit is sturdily constructed. A rib cast iron air container is mounted between the motor and the compressor on a pressed metal base, all of which is mounted on rubber feet. The cylinder and base are cast in block of seasoned gray iron and accurately machined. Ten feet of rubber-covered electric cord, attachment plug, and ten feet of durable braided rubber air hose are attached to the outfit.

The new Hurley unit is complete ready for use upon delivery. The inexperienced or experienced operator merely plugs the electrical connection into a nearby light socket, places the material into a quart pressure container, and starts to work, according to the manufacturer's announcement.

New Type of Barrel Plater

In an effort to eliminate "treeing" or the growth and spread of metal contacts in mechanical plating barrels, the engineers of the Crown Rheostat and Supply Company, Chicago, Ill., who



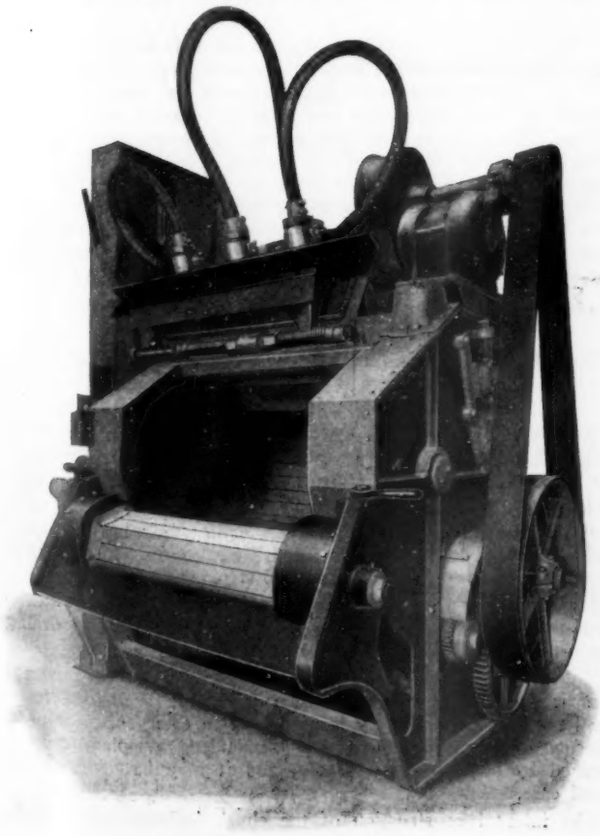
New Type of Barrel Plater

made an intensive study of this plating evil, have developed an apparatus in which the "treeing" evil is stated to have been removed. As it was found that construction of ordinary plating cylinders was the chief cause of treeing, a new type of cylinder was devised in which nuts and bolt-heads which formerly were the cause of much "treeing" were eliminated. This was done by the construction of what the company calls the drive-fit dowelled and grooved assembly of heavy one-piece heads, made of bakelite and said to be "tree-proof." In this type of cylinder all nuts, bolts, screws and other metal parts that could cause "treeing" have been eliminated.

It is stated that the entire construction is heavier, and the all-bakelite feature provides strength, insulation and resistance to corrosive attack. Another feature is the absence of center rod through the cylinder. The cylinder is supported by the heads, into which the side panels are grooved and dowelled. Elimination of the center rod is stated to facilitate loading and unloading, and to eliminate some of the possibility of damaging plated articles. The time-saving factor is also stressed. Greater ability to keep plating processes under scientific control is also stated to be possible with the new device.

Tumbling Sand Blast Machine

A new type of sand blasting machine has been introduced by The American Foundry Equipment Company, Mishawaka, Indiana, which embodies several principles said to be new in the process of cleaning castings and other articles by the use of sand under high pressure. The machine is of the barrel type, although the usual barrel has been supplanted by a housed endless apron made of 34 double steel angle staves which run over steel sprocket wheels that are motivated by link chains. The apron holds the load and revolves it while the sand blasting is applied through three stationary pressure type nozzles which pour a continuous curtain of sand over the entire width of the apron. The nozzles are fitted to the door, which raises to permit loading. Unloading is accomplished by reversing the apron, making for speed and labor-saving. Steel shot, grit or sand can be used as abrasive material. The four chief features claimed for the apparatus are type and location of nozzles (see illustration), manner of tumbling load with door open for inspection, ready means of loading and unloading, extreme efficiency of operation.

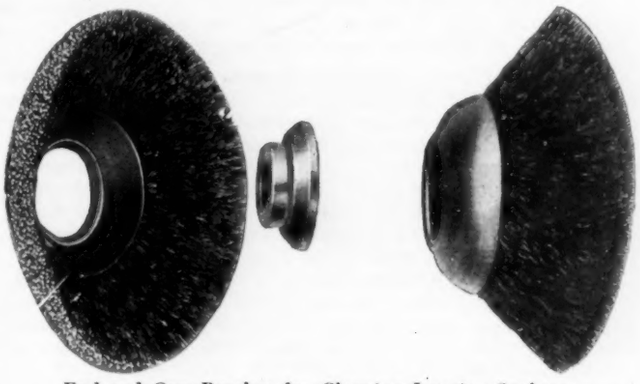


American Tum-Blast Cleaner

Brushes for Inside Cleaning

The cup and end brushes in the accompanying illustrations have been designed for cleaning interiors of tanks, barrels, boilers, tubes, castings and other maintenance and production jobs where the ordinary circular brush is not effective. They are manufactured by the Specialty Manufacturing Company, Cleveland, Ohio. The makers state that these brushes may be used either on a polishing spindle or in conjunction with flexible shaft equipment, and may be made up into gangs for any desired shape of brush surface. They are available in all regular sizes and of any desired stiffness of wire or bristle.

The cup brush has bristles or wires locked between conical plates and is capable of cleaning in a forward direction as well as sideways, and can be inserted into pitchers, headed containers, tanks, etc., whose openings are smaller than the bottom



End and Cup Brushes for Cleaning Interior Surfaces

to be cleaned. For corners and orifices so narrow that even the cup brush cannot do a good job, the end-brush is used. The use of the brushes is not confined to interior work. They can be used for exterior cleaning, but in such cases the ordinary type of "perfect balance" brush is generally preferable. Among the many uses suggested are the removal of scale and sand from cored castings, polishing of hollow-ware, garage work such as cleaning out cylinders and valve stem guide holes, preparing metal interior surfaces for welding, etc.

Treating Aluminum

An entirely new process for treating aluminum, which not only hardens aluminum but also eliminates all tendency of the surfaces to smudge, tarnish or scratch, imparting to aluminum a new ability to resist the effects of salt water and the various acids and other corrosive agencies recognized as destructive enemies of aluminum, is said to have been discovered in Cleveland by engineers of the Perma-Chrome Process Corporation. The new process also provides a protective surface finish which has already disclosed new possibilities in delicate color effects.

The new process is said to be especially interesting to manufacturers of light aluminum stampings because of its speed, its economy, and the completeness with which it effectively hardens and finishes any aluminum stamping. In its effect it may be compared to the cyanide process of hardening the surface of steel. Every item treated is completely submerged and the effects equally imparted to every part of the metal. Another advantage claimed is that aluminum's inherent advantages of ductility and flexibility in forming, shaping, stamping or spinning are preserved and the new hardening and finishing process applied as a last stage in manufacture.

Scleroscope tests in the laboratory of one big concern showed an increase in hardness of over 100 per cent. The scleroscope reading for standard aluminum being 7 points—the reading for same sheet after treatment being 16 points.

This method of treatment comes as a result of research conducted by Harry F. Gardner, formerly of the United States Bureau of Standards, in the interest of a new aluminum ice cream freezer now being marketed by the Electric Refrigeration Division of the General Electric Company. One of the first results of the discovery was an order to treat ten thousand aluminum cafeteria trays. The object sought here was the elimination of smudge, that lead-pencil-like contribution of aluminum ware which frequently decorates the hands and faces of cafeteria patrons. A

second motive was to secure the attractive new finish with smooth, hard surface, not easily scratched, that characterizes products treated by the new process, for which no name has yet been coined.

Tested for 338 hours in a twenty per cent salt solution, metal treated by the process is said to show absolutely no effects. Subjected to hydrochloric acid, the process showed, under time test, twenty times the resistance of aluminum or aluminum alloys. Tests conducted in connection with cooking utensils such as toasters, waffle irons, coffee urns, lemon squeezers, ice cube containers for electric refrigerators and similar items, show an entire absence of tarnish even under sustained exposure of heat or cold. Fried eggs no longer stuck to an aluminum spider, treated by the process; potatoes boiled in an aluminum vessel failed to discolor the aluminum at the point of evaporation as before.

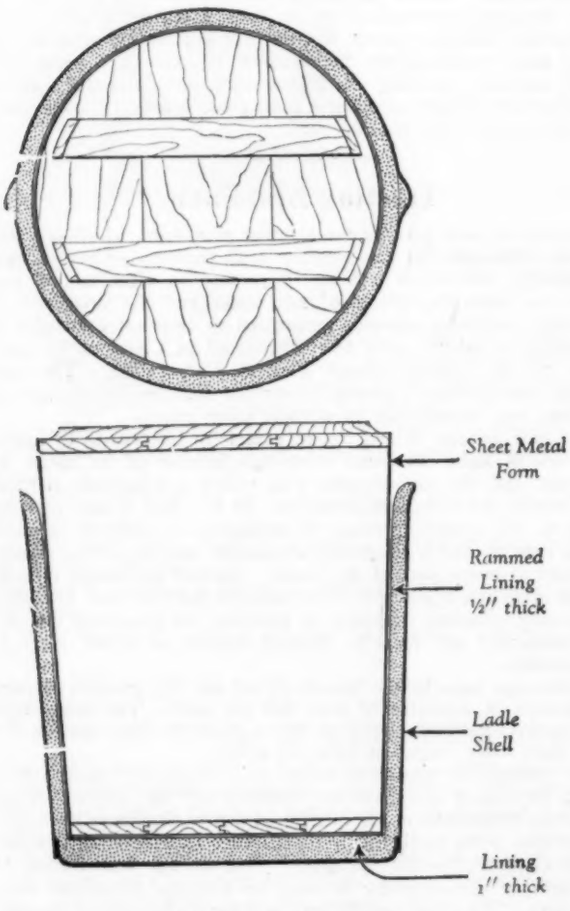
Lining Ladles in Brass Foundries

By H. W. SLUSSER
Foundry Superintendent

The Quigley Furnace Specialties Company, New York City, has been conducting thorough experiments in the uses of high temperature cements for ladle linings. The company found a large number of cements to choose from and first made preliminary tests in a small way to determine their merit. The majority were discarded as not suitable for the purpose. The final test summered down to three products on which actual practice tests were made in lining 300-lb. ladles used in the company's brass foundry, it is stated. The method of lining is shown in the diagram.

Standard type 300-lb. ladles were used. First a form was made for the ladle of a wooden frame covered with galvanized sheet iron having the proper taper from top to bottom and projecting about three inches above the top of the ladle. The top and bottom of the form was solid.

The bottom of the ladle was filled first with the refractory mixture to a depth of about 1 inch, then the form was placed on top of this and the refractory mixture rammed in between the form and the ladle with a flat metal tool. After the ramming-in was completed, the form was removed by tapping it and giving it a slight turn, at the same time drawing it upward.



Method of Lining Ladle

This method of lining was tried out with three selected refractories which are designated as refractories A, X and Y. A careful record was kept of costs of each lining, the number of heats secured from each lining and the temperature drop in the metal while carrying the ladles from the melting furnace to the molds, a distance of about 200 feet. The results of these tests were as follows:

Costs and Service

	Cost Per Lining	No. of Heats	Temperature drop
Refractory X.....	$1.40	20	150° F
Refractory Y.....	.82	35	100° F
Refractory A.....	.40	150 to 200	60° F

From the table it is evident that refractory A was far superior to the other two, being much lower in cost per lining, much higher in number of heats and again much lower in temperature drop, showing a combination of long service coupled with good insulating qualities and low cost.

The mixture used in refractory A was two-thirds crushed fire brick and one-third "Hytempite," manufactured by the Quigley company. In making this plastic mixture the cement was first diluted to a pancake batter and then the crushed fire brick was added. The mixture was reduced to 1/16 mesh, including fines, very thoroughly mixed until it formed a mixture which, when squeezed in the hand, would show no free moisture, but would cling together. After withdrawing the mold, the finished lining was first dried out with a gas flame and then brushed over with a thin wash coat of "Hytempite" batter. As a result of these tests, the company has standardized on refractory A for ladle linings in its brass foundry.

Electric Drill

The Goodell-Pratt Company, general offices and plant, Greenfield, Mass., have, in keeping with their aggressive policy and with the times, recently brought out a line of very interesting electric drills.

Being pioneers of hand and breast drills and other machinists' and carpenters' tools, the new Goodell-Pratt Super-Electric Drill, to use its full name, is only a natural step.

It was among the first to appear with the chuck set on a line with the horizontal top of the drill, permitting close-up drilling against walls or under ceilings or other projections.

To further facilitate close-quarter drilling, a special, unusually compact ball-bearing chuck has been developed. While constructed for gear operation, the key is used only in emergencies or under unusual operating conditions, as tremendous gripping power is secured by hand-tightening alone, and it may be loosened with equal ease.

The internal construction of the chuck is such that the jaws

are self-tightening; the greater the torsional strain, exerted on them by the drill, the tighter they grip.

By locating the gear ring at the rear of the chuck, many of the difficulties encountered in operation are eliminated.

Ball breakage is eliminated by dispensing with ball bearings except in the thrust, long sleeve bearings of high-speed bearing metal, perfectly aligned, being found more efficient and lasting for the high speeds at which the armatures turn.

A capacious and efficient wick-oiling system tightly sealed against leakage provides lubrication for the armature shaft bearings.

The spindle bearings as well as the gear bearings are all double end, line reamed after assembly to secure perfect alignment. All gear bearings are of best bearing bronze and are thoroughly lubricated by grease from the grease tight gear case.

A fan of sufficient capacity to keep frame and handle comfortably cool and still maintain the efficiency of the motor at its height is mounted in perfect balance on the armature shaft in a separate chamber located between the armature and the gear case. The air is drawn through holes in the end handle cap impinging directly on brushes and commutator and passing between the armature and field on through the fan and expelled through holes in the periphery of the frame. The location of the intake holes practically eliminates the possibility of dirt and dust being drawn in when the drill is laid down with the motor running.

The special, non-kinking flexible cable is highly acid and oil resistant and is fastened to the body of the drill with a patented three-jaw lock, making it impossible to pull or jerk the cable out, and relieving the strain on the terminals.

Goodell-Pratt super-electric drills are now being made in 1/8, 3/16, 1/4 and 3/8 in., heavy duty, 1/2 in., light duty, 1/2 in., and 5/16 in., standard, 1/2 in., and 5/8 in., heavy duty and 7/8 in., standard. Drill stands, bench clamps and special arbors for holding grinding wheels, scratch brushes, etc. are also furnished. These are fully described in a new electric drill catalog recently from the press, copies of which can be obtained by addressing the manufacturers at Greenfield, Mass.

Carbon Fuel Process and Furnace

The Barrett Company, 40 Rector Street, New York City, has developed and perfected a process for melting and refining nonferrous metals in direct contact with their special fixed carbon fuel, and in a cupola type of furnace. The process is of particular value for the melting and casting of red brass or bronze, high lead bearing alloys and casting copper.

Metal charges of 500 lbs. to 600 lbs. are charged directly on top of the incandescent bed of fixed carbon fuel, and this charge is ready to tap into the pouring ladles in from 11 to 16 minutes.

These metal charges may consist of all chips (borings and turnings), all ingots, or mixed heats of chips, gates, scrap and ingots.

Pouring temperatures are regulated by air control and depth of fuel bed, and metal pouring temperature of 2,500° F. can be secured without any trouble.

The outstanding features claimed for this new process are:

Unusual and uniformly high grade of metal secured at the tap hole, thereby reducing the number of rejects in foundry and machine shop.

Extremely low total cost of melting per ton and of metal charges, due to high metal to fuel ratio.

High speed melting.

High metal recovery.

Ability to use more foundry scrap, chips, etc., and less composition ingots, without in any way affecting the quality of the castings.

Low cost of furnace maintenance and up-keep.

Freedom in the foundry from heat, fumes, gases and noise.

Extreme flexibility of process and furnace.

Simplicity of operation.

Economy of floor space.

A number of highly successful installations have been made in some of the largest and most prominent foundries in the country.

This new process bids fair to revolutionize present melting methods in the non-ferrous metal industry.

This process and the fuel utilized in it are covered by patents and pending patent applications.

Equipment and Supply Catalogs

Houghton's Absorbed Oils. E. F. Houghton and Company, Philadelphia, Pa.

The Polytechnic Institute of Brooklyn, New York. Bulletin of graduate courses 1929-30.

The Largest and Most Powerful Ever Built. The National Machinery Company, Tiffin, Ohio. Forging machinery.

Alemite Industrial Lubrication. Alemite Manufacturing Corporation, 2650 North Crawford Avenue, Chicago, Ill.

The Duriron Company, Inc., Dayton, Ohio. Bulletin No. 153 on centrifugal pumps; Bulletin A, Durimet, a new nickel-silicon alloy.

Trent Laboratory Apparatus Heated Electrically. Harold E. Trent Company, 439-443 North 12th Street, Philadelphia, Pa. Leaflet TA-23.

Stop the Crowds with Chromflex. Apollo Metalarts, La Salle, Ill. Handsome brochure on chromium plated sheets for display and other purposes.

Oesterlein Aurora Drills. The Aurora Tool Works, Cincinnati, Ohio. Complete catalog of the company's line of drilling machines. Illustrated.

Electric Heat for Industry. Public Service Company of Northern Illinois, Chicago, Ill. Large, 33-page illustrated book describing applications of electric heat in industry.

United States Construction Quarterly. David Lawrence Publications, Washington, D. C., April-June, 1929, issue. Information on construction from Government sources.

Globe Seamless Steel Tubes. Globe Steel Tubes Company, Milwaukee, Wis. Large illustrated book covering manufacture of seamless tubes, showing equipment and operations.

Gas Welding and Cutting Apparatus. Torchweld Equipment Company, Chicago, Ill. Catalog No. 29, covering complete line of this company's products, in 40 pages, 8½ by 11 in.

Quinn Oil Burning Equipment. Combustion Engineering Corporation, 200 Madison Avenue, New York City. Torches, cocks, valves, steam atomizing oil burners, low pressure burners.

Brass, Bronze, Copper and Iron Novelties. The Cincinnati Artistic Wrought Iron Works Company, 2941 Eastern Avenue, Cincinnati, Ohio. Large illustrated catalog of this company's products.

Trenton Manufacturers and Their Products. Trenton Chamber of Commerce, Trenton, N. J. Complete list of manufacturers in one of the country's large cities, with notations of the products they make.

Pickl-Aide. The Weaver Brothers Company, Adrian, Mich. Monthly publication of small size, edited by Curt Weaver, consisting of calendar, note pages and some comments and advertising relative to pickling of metals.

Ladles. Whiting Corporation, Harvey, Ill. Catalog No. 210, giving full details and specifications of new ball bearing helical worm-geared ladles, standard worm-geared and pin spur-geared ladles, as well as many smaller types.

Heat-Treating and Carburizing Furnaces. W. S. Rockwell Company, 50 Church Street, New York City. Bulletin 295, covering enclosed front type annealing, hardening, normalizing, carburizing and drawing furnaces, electric or other heat.

The C. I. C. Titration Set. Walter S. Wood Company, 15 Wharf Street, Boston, Mass. Booklet describing apparatus for determining chlorides in nickel plating solutions. Contains technical data.

Buyers' Guide for Nickel Alloy Steel Products. The International Nickel Company, Inc., 67 Wall Street, New York City. Lists of names of firms using nickel alloy steel products, departmented according to products used.

Flexible Shaft Machines. Linick, Green and Reed, Inc., 10 South Wabash Avenue, Chicago, Ill. Booklet to be issued September 15, dealing with flexible shaft machines for polishing, grinding, burnishing, reaming, chasing, engraving, sawing, cutting, snailing, diamond-and stone-setting. Free on request to the company.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Leaflet 20340-B, 300 and 400 ampere single operator welding sets; Leaflet 20416, drum controllers for general reversing service and for dynamic lowering hoist service.

Sirocco Forced Draft Fans for Domestic Heating Plants. American Blower Corporation, Detroit, Mich. Bulletin No. 10401. Also, **Venturafin Method of Heating.** Bulletin No. 7818. The latter describes a method for distributing and controlling heat for houses, factories, etc., with full engineering data.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Association

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Los Angeles Branch (Temporary)

HEADQUARTERS, CARE OF M. D. RYNKOFS, 1354 WEST 25th STREET, LOS ANGELES, CALIFORNIA

Officers Elected

The regular monthly meeting was held as usual the second Wednesday of the month at the Y. M. C. A. at 6:30 p. m. Thirty-three sat down to dinner. The following were elected to office for the coming year: President C. E. Thornton; vice-president, D. M. Bedwell; secretary-treasurer, M. D. Rynkofs; librarian, C. Russill; assistant librarian, J. Ellis; sergeant-at-arms, J. Jacques; board of managers, E. W. Francis, H. H. Dimmitt and F. C. Rushton.

There were four visitors: Mr. Maurer, chemical engineer, Edison Application Company, Ontario, Cal.; R. Wild, R. J. Lockie and M. McBennett. The latter two made application for membership.

Letters were read from E. W. Heil, whom we hope to have at our next meeting, and from J. Caslis, Providence, R. I., on gold plating. A vote of thanks was ordered sent to J. Caslis for his interest in the baby branch.

Pitting of nickel deposits, gold plating and chrome plating were discussed.

M. D. RYNKOFS.

New York Branch

HEADQUARTERS, CARE OF J. E. STERLING, 2581 46th STREET, ASTORIA, LONG ISLAND, N. Y.

August Meeting

The New York Branch held its regular monthly meeting August 23, 1929, at the World Building, Park Row, N. Y. R. J. Liquori, vice-president, was chairman. There were few members present, due to the heat, but those who attended were there to learn something. They set about it by asking Librarian H. Levine questions on every conceivable solution, which he answered like a veteran.

C. HAUSHALTER.

Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE, ROCHESTER, NEW YORK

Meeting Held at Buffalo

Members of the Rochester Branch residing in Buffalo, Niagara Falls and Rochester were present at a dinner of the Branch held at the Hotel Lafayette, Buffalo, N. Y., last month. The Branch held a good meeting after the dinner, a number of speakers addressing the assembled platers. After transacting the month's business, President Clarence Reams gave a short talk on the benefits of membership in the Society and then turned the meeting over to S. P. Gartland, representing the Rochester members. He outlined the work the Rochester men have done to bring the Branch up to its present high status.

Frank Kolb, chief chemist of the Bausch & Lomb Optical Company, Rochester, gave an address in which he urged the platers of Buffalo to organize their own Branch, declaring that the industrial expansion of the city, and its employment of many platers made it requisite that an active and independent body of platers form in the city.

L. R. Eastman, chemist of Frederic B. Stevens, Inc., Detroit, Mich., spoke on polishing compositions. His talk was extremely interesting and instructive to the members who loudly applauded the address, offering Mr. Eastman a vote of thanks.

CHARLES GRIFFIN.

National Metal Congress and Exposition

HEADQUARTERS, 7016 EUCLID AVENUE, CLEVELAND, OHIO

Plans Fully Arranged

Complete arrangements for the National Metal Congress and the National Metal Exposition, which will take place simultaneously with meetings of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, the American Welding Society (see other columns) and the American Society for Steel Treating, September 9 to 13, inclusive, have been made, including allotment of space to more than 250 manufacturers who will display their metal products and equipment.

Our August issue containing an excerpt from the program of technical sessions, giving data on all papers of interest to the non-ferrous and plating industries. The Institute of Metals Division papers were covered there, and the American Welding Society's papers of interest to the non-ferrous industries are given in an adjoining column.

A complete report of all proceedings will be given in the next issue.

American Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

Pittsburgh Industries Cooperate with Electrochemists

In conjunction with the Fall meeting of the American Electrochemical Society, to be held at Pittsburgh, Pa., September 19th, 20th and 21st, a number of the industries in the Pittsburgh district have cooperated with the Society, extending to its members the courtesy of a personally conducted

tour through their plants. Special trips will be arranged to the works of the following:

Westinghouse Electric and Manufacturing Company; Firth Sterling Steel Company; National Tube Company; U. S. Aluminum Company; Duquesne Light Company; Carnegie Steel Company; Pittsburgh Coal Company; U. S. Light Storage Battery Company; Jones and Laughlin Steel Corporation; Lustro Coated Steel Company; Standard Steel Spring Company; National Casket Company.

In addition to these plant visits, the meeting will consist of a number of technical sessions, sight-seeing tours, golf and a special program for the ladies. There will be special sessions devoted to a symposium on "Contributions of Electrochemists to Aeronautics," "Electrothermics," and "Electrodeposition." There will also be an exhibit of recently developed apparatus and electrochemical products. The program includes the following:

Symposium on Contributions of Electrochemistry to Aeronautics

T. W. Bossert: Use of Aluminum and Aluminum Alloys in Aircraft.

E. H. **Dix, Jr:** Alclad Aluminum Alloys for Aircraft.

J. D. **Edwards and C. S. Taylor:** Electrolytic Potentials between Aluminum and Its Alloys.

W. G. Harvey: The Use of Magnesium and Its Alloys in Aircraft Construction.

Discussion of above papers will be led by the following:

Edward P. Warner, Editor of "Aviation"; Dr. George W. Lewis, Director of Aeronautical Research, National Advisory Committee for Aeronautics; Starr Truscott, Assistant to the Director of Research, National Advisory Committee for Aeronautics.

Miscellaneous Papers

Chromium Plating, by Dr. R. J. Piersol of the American Chromium Corporation, Wilkinsburg, Pa.

Recent Developments in Electric Melting, by Frank W. Brooke, The William Swindell Corporation, Aspinwall, Pa.

A New White Finish on Aluminum, and also a **New Explanation of Anodic Passivity in Sulphuric Acid,** by Leon McCulloch, Westinghouse Research Laboratory, East Pittsburgh, Pa.

A Sixty Cycle Coreless Induction Furnace Installation, by Porter H. Brace, Westinghouse Research Laboratory, East Pittsburgh, Pa.

Chromium Plating Baths, by Schneidewind and Willard.
Potentiometric Titration, by Kahlenberg and Krueger.
Cathode Potentials of Copper, by Smith and Breckenridge.

American Welding Society

HEADQUARTERS, 33 WEST THIRTY-NINTH STREET, NEW YORK, N. Y.

Fall Meeting

Continued rapid expansion of welding applications, backed by extensive research activities, is revealed in the preliminary distribution of the Fall meeting program by the American Welding Society, to be held in Cleveland, Ohio, September 9 to 13, with morning sessions at the Hotel Statler and afternoon sessions and extensive exhibits at the Cleveland Public Auditorium.

There will be six technical sessions this year and nine research papers will be presented, three dealing with newly discovered non-destructive tests of welds. One of these tests, based on electrical conductivity, is the discovery of Elmer Sperry, well-known inventor and president of the American Society of Mechanical Engineers. The second involves the use of the stethoscope and the third X-ray methods.

Other research papers cover "nitrogen needles"; electric welding by the carbon and metallic arcs; special metallographic studies; stress-strain characteristics of welded joints; the use of X-rays in examining welds; welding of boiler tubes and drums; tubes of mercury boilers, etc.; gas welding of steel buildings; automatic welding of thin sheets; welding of pipe lines; replacement of castings by welding in machine construction; welding of copper alloys and high-strength aluminum alloys.

In addition to the nine research papers, three special sessions will be devoted largely to research.

Those attending the A. W. S. Fall Meeting may profit also by the sessions of the American Society for Steel Treating, the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, the Institute of Metals Division of the American Society of Mechanical Engineers, which are meeting simultaneously in Cleveland during the week of September 9. The cooperation of these groups makes possible a great exposition in the Cleveland Public Auditorium, as stated in another column.

Personals

Ernest V. Pannell

Ernest V. Pannell, formerly technical advisor to The British Aluminum Company in New York, is leaving the United States to take the position of manager of The London Aluminium Company, Birmingham, England, a large manufacturing concern specializing in stampings and other light fabricated forms of aluminum.

Mr. Pannell, who is a graduate engineer, was born and educated in London, England. He has been associated with The British Aluminum Company for nearly twenty years, having served in the fabricating plants of the company, and later specializing in the development of aluminum wire and cable for electrical transmission. He was responsible for a number of significant improvements in the manufacture of aluminum conductors and in line construction methods, as well as in the commercial development of the material in Great Britain, Canada, and Japan.

Ernest V. Pannell

After having charge of the Toronto office of the company, Mr. Pannell came to New York in 1919 and spent the ensuing ten years in developing sales of aluminum and aluminum alloys along engineering lines by personal cooperation with independent foundries, mills and factories. He is now leaving to assume the management of an important company engaged in fabricating aluminum and light alloys, The London Aluminium Company, Ltd., of Aston, Birmingham, England.

Mr. Pannell is a fellow of the American Institute of Electrical Engineers and a member of the corresponding British institution. He also has membership in the American Society for Testing Materials, American Institute of Mining Engineers, Society of Automotive Engineers and other societies, and besides being the author of a textbook, "High Tension Line Practice," has been responsible for a number of articles in the pages of THE METAL INDUSTRY and other technical journals.

Henry S. Rawdon

Henry S. Rawdon has been appointed chief of the division of metallurgy of the United States Bureau of Standards, Washington, D. C., succeeding Dr. H. W. Gillett, who recently resigned to become director of the Battelle Memorial Institute, Columbus, Ohio.

Mr. Rawdon was born in England not far distant from the "metallurgical center" of that country, has resided in the United States since he was four years of age. He was educated in the public schools of Michigan.

After graduating from the Michigan Normal College he was engaged in school work as high school principal and superintendent

for six years. Later he graduated from the University of Michigan in metallurgical engineering. While there he was private assistant to the late Dr. E. D. Campbell.

Upon graduation (1912) from the University he went directly to the Bureau of Standards as assistant physicist in charge of metallography in the newly formed division of metallurgy.

In 1918-19 he was sent by the Bureau of Standards to England and France to obtain information on foreign metallurgical practice with respect to phosphorus and sulphur in steel.

He has made numerous contributions to metallurgical literature especially along the lines of metallography and the corrosion of metals, and has been active in committee work of the American Society for Testing Materials and other technical societies.

On July 1 he was appointed Chief of the division of metallurgy.

Henry S. Rawdon

E. S. Bassett, president of The Cowles Detergent Company, Cleveland, Ohio, left with Mrs. Cowles for a European tour on August 31, taking the S. S. Franconia for Liverpool, from which point they will tour England by automobile. From London they intend to fly by airplane to Paris, where they will stay for a time, making trips to other points on the continent. On November 6 they expect to leave Bremerhaven, Germany, on the S. S. Bremen, for New York. The trip had been planned for some time.

F. C. Hosimer has been transferred from the home office of the Wagner Electric Corporation, St. Louis, Mo., to the Chicago branch sales office, where he will represent the company in the capacity of salesman. Mr. Hosimer is a Purdue University graduate (1925); after college he joined the Wagner organization as student engineer, later becoming a sales correspondent and now a salesman.

E. J. Schwanhausser, for the past two years assistant works manager at the Harrison, N. J., plant of the Worthington Pump and Machinery Corporation, has been appointed manager of that company's works at Buffalo, N. Y. Mr. Schwanhausser is thirty-five, one of the youngest of the company's executives. He is a graduate of Stevens Institute of Technology. During summer vacations he worked for the Worthington company; upon graduation in 1915 he joined the company as test and erection engineer, was later transferred to other departments and finally became assistant works manager. His transfer to Buffalo is another promotion.

Obituaries

Alfred Hutchinson Cowles

Alfred Hutchinson Cowles, scientist, inventor, economist, best known for his development of the Cowles aluminum reduction process, died August 13, 1929, at his home at Sewaren, N. J., in his seventy-first year. His death deprives the science of metallurgy of one of the greatest minds that has yet turned its attention to it. To Mr. Cowles the world is indebted for the commercial production of aluminum at low cost, for similar quantity production of calcium carbide, carbon disulphide, acetylene gas, and, to some extent, phosphorus and carborundum.

Alfred H. Cowles

Mr. Cowles was born in Cleveland, Ohio, on December 8, 1858. After attending the public schools there, he spent two years at Ohio State University and then went to Cornell University where he became devoted to scientific studies which he continued, with some interruptions, for the rest of his life. He engaged in mining for some years, operating in New Mexico. After that, having sold a mining interest, he turned for a time to journalism, joining the Cleveland Leader which was founded by his father, Edwin Cowles. He retained his scientific interests, however, and went into research work in electric furnaces, with particular reference to aluminum production and alloys of aluminum. In 1885 this interest took form in the organization of the Cowles Electric Smelting and Aluminum Company, Lockport, N. Y., which erected the first electric smelting plant in the world the following year. This plant is still in existence under the name of the Electric Smelting and Aluminum Company.

The operations of this company, under Mr. Cowles' supervision, resulted in the development of processes for producing cheaply the substances mentioned previously.

The Cowles company met with intense objection to some of its work in aluminum and for a number of years was embroiled in patent litigation with the Aluminum Company of America. However, the Cowles company won the suits and its opponent was found to be infringing upon Cowles patents on processes for the electrolytic recovery of aluminum from bauxite. The company was very successful, establishing an English unit, the British Aluminium Company. With the Aluminum Company of America terms were arranged whereby that company was permitted to produce aluminum under the Cowles and Bradley ptents as licensee. The British company was the first to produce cheap aluminum in commercial quantities in Europe. Mr. Cowles was associated with his brother, Eugene Cowles, in his work and to them jointly is due the credit for developing processes which greatly reduced the prices of many valuable materials, making possible wide application of such work as oxy-acetylene welding and lighting, carborundum grinding and polishing, and many processes requiring phosphorus and carbon disulphide.

From 1898 to 1904 Mr. Cowles was vice-president of the Cleveland Leader, in which he continued to retain his interest, along with his scientific and economic pursuits which, nevertheless, remained uppermost. In 1895 he became president of the Electric Smelting and Aluminum Company, which is the present name of the original Cowles firm at Lockport. From 1902 to 1918 he was vice-president of the Pecos Copper Company. During the latter years of his life he devoted himself to research in the production of alumina directly from clays and aluminum directly from alumina.

Mr. Cowles was distinguished in 1886 by the award, to him and his brother, of the Elliot Cresson medal and the John Scott Legacy Medal at the Franklin Institute. In 1889 he was given the Paris Exposition Gold Medal. He was a founder of the American Electrochemical Society, of which he was vice-president in 1908-1909; a fellow of the American Institute of Electrical Engineers and of the American Association for the Advancement of Science; a member of the American Institute of Mining and Metallurgical Engineers, the Mining and Metallurgical Society of America and of the Franklin Institute.

He was married in November, 1906, to Helen J. Wills, daughter of James Mortimer Wills, founder of the U. S. Stoneware Company, Akron, Ohio. Mrs. Cowles, his brother Lewis Cowles and his sister, Mrs. Charles W. Chase, survive.

W. S. Eckert

W. S. Eckert, since 1924 associated with W. Parsons Todd, manager of sales for the Copper Range Company, New York, died August 8, 1929, at the Post-Graduate Hospital, New York City, in his sixtieth year. He had been ill for about a month. For about forty years he had been prominently identified with the copper and cable trade. He was an official of the National Conduit and Cable Company when it operated a plant at Hastings-on-the-

Hudson, N. Y., and later he was identified with the Baltimore Tube Company, Baltimore, Md.

When the copper industry determined after the war to carry on a wide sales promotion campaign, Mr. Eckert became the first secretary of the Copper and Brass Research Association.

He is survived by his wife, a son and a daughter.

William S. Claflin

William S. Claflin, head of the firm of Clafflin & Brother, Providence, Rhode Island, jewelry manufacturers, died at his home in Riverside, suburb of Providence, on July 21, 1929. Mr. Claflin had been identified with the jewelry industry for nearly half a century. Born in Tyringham, Mass., in 1860, he was educated at Springfield and went to Providence in 1880, where he lived the rest of his life. There he organized the firm of Claflin & Fowler, later reorganized as Claflin & Hanke. About 1890 he joined with his brother, Abner E. Claflin, in the firm of which he was head until his death.

He is survived by his wife and his brother, Abner.

William H. Waite

William H. Waite, Providence, Rhode Island, jewelry manufacturer, former president of the Waite-Thresher Company of that city, died at the age of 82 on August 14, 1929. Mr. Waite was a native of Providence, where he started his business career as a grocery store clerk, later a shoe clerk, then owner of a shoe business and then general manager of Waite, Smith & Company, jewelry manufacturers, of which his father was head. This company reorganized in 1892 to form the Waite-Thresher Company, of which Mr. Waite was president until his retirement in 1921.

Charles E. Pack

Charles E. Pack, eastern sales representative of the Lava Crucible Company, Pittsburgh, Pa., died at his home in Bridgeport, Conn., July 13, 1929, in his fifty-fourth year. He had been the eastern salesman for the Lava company for six years and was widely known in the non-ferrous foundry trade.

News of the Industry

Industrial and Financial Events

De Vilbiss Company Expansion

The remarkable recent expansion of a Toledo industry long established in European countries is revealed in the departure of Allen D. Gutchess, president of The DeVilbiss Company, Toledo, Ohio, on a tour of the overseas subsidiary DeVilbiss companies and DeVilbiss foreign sales offices. Mr. Gutchess, accompanied by his wife, sailed on the Leviathan August 16. He will be abroad for several weeks. In England, France and Canada, The DeVilbiss Company is incorporated under the laws of those respective countries and operates manufacturing and sales establishments in every way as local enterprises. The company has sales and service facilities in every principal city of the world, some of those in Europe operating under the supervision of the European DeVilbiss companies. These foreign operations have existed profitably in their markets for years, but within recent months the increasing industrial activity in many countries has so developed existing and potential markets for DeVilbiss products as to necessitate much more comprehensive manufacturing and sales operations. Mr. Gutchess' trip is to arrange for these expansions, it is stated. An interesting incident is the fact that The DeVilbiss Company commenced to set up its European operations following the wedding trip of the late Thomas A. DeVilbiss to Europe. Mr. DeVilbiss took with him samples of the products then manufactured by the company and discovered the sales possibilities existing in overseas markets for his company, then an infant Toledo industry.

Allen D. Gutchess

Revised U. S. Copper Tube Specifications

The Federal Specifications Board, Washington, D. C., has issued proposed revision of United States Government Specification No. 287 covering seamless copper tubing and seamless copper pipe in standard iron pipe sizes. A complete copy of the proposed specifications may be had upon application to the Board, which is Promulgating purchasing specifications on various commercial commodities used by Government departments and requests criticisms from manufacturers and other interested parties, who, in the present case, are required to present their comments by September 23, 1929, for consideration by the Board.

New Chase Brass Plant to Start

Chase Brass and Copper Company, subsidiary of the Chase Companies, Inc., Waterbury, Conn., will commence operations at its newly erected plant at Euclid Village, near Cleveland, Ohio, about October 1, 1929, according to press reports from Cleveland. By that time, it is estimated by company officials, the first unit, consisting of sheet and rod mills, will be ready for operation, while the second unit, tube mills, will not begin production until a later date. On the latter only the steel work has been erected, while the former is practically complete. Work on other parts of the new plant, which will cost $6,000,000 eventually, is progressing rapidly, it is stated.

Ajax Metal Company Expands

In order to meet the rapidly expanding demand for Ajax-Wyatt electric melting furnaces, The Ajax Metal Company, Philadelphia, Pa., has just completed the construction of an entirely new plant which will be used exclusively for manufacturing Ajax-Wyatt electric melting furnaces. Ample provisions have been made for carrying on experimental work as well as providing the most modern storage and handling facilities for service parts and lining materials. The new building is located on Frankford Avenue, below Girard Avenue, Philadelphia.

General Cable Corporation

General Cable Corporation, New York, has purchased a series of eight one-story buildings on Kingsland Avenue, Harrison, N. J., from the Herald Manufacturing and Trading Corporation. The purchase comprises 160,000 sq. ft. of space, and at one time was the plant of the New Jersey Tube Works, for which it was originally built. In 1924 the A-A Wire Company, subsidiary of General Cable Corporation, leased the plant with option to purchase.

Color Markings to Identify Metals

Color designations for various metals to identify bars, billets, ingots and slabs, have been announced by the Federal Standard Stock Catalog Board, Federal Coordinating Service, Bureau of Standards, Washington, D. C. The colors will be placed on the ends of the pieces of metal to indicate their composition, as, for instance, solid black meaning hard-drawn copper, black with white stripe, copper-

nickel alloy, solid pink, rolled naval brass, etc. The colors have been used by the Navy for about 15 years and will presumably become standard marks for all government departments. Detailed data will be published and may be found applicable by industry, the advance announcement states.

Ingot Brass Prices and Sales

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending August 16th. As there are, as yet, no generally accepted specification for ingot brass, it must be understood that each item listed below is a compilation representing numerous sales of metal known to the trade by the designation shown, but each item, in reality, including many variations in formulas. Until the program of standardizing the principal specifications, now progressing in cooperation with the American Society for Testing Materials, is completed, the following specifications will be understood to refer to "commercial grades."

Commercial 80-10-10 (1% Impurities)	17.011c
Commercial 78% Metal	15.094c
Commercial 81% Metal	15.386c
Commercial 83% Metal	15.826c
Commercial 85-5-5-5	15.897c
Commercial No. 1 Yellow Brass Ingot	12.882c

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of July, 1929, amounted to a total of 7,698 tons. On August 1st, unfilled orders for brass and bronze ingots and billets on the books of the members amounted to a total of 13,243 net tons.

Yale and Towne Manufacturing Company

Yale & Towne Manufacturing Company, Stamford, Conn., reports assets of $24,727,536 as of June 30, 1929, as against $24,240,063 December 31, 1928. Total surplus was $11,412,615 at the mid-year against $11,539,551 at the beginning of the year. Current assets were $15,286,447 and current liabilities $2,314,921, comparing with $14,922,017 and $1,700,511 respectively on December 31, 1928.

New Companies

Moe Brothers Manufacturing Company, 113-121 East Clybourn Street, Milwaukee, Wis., has been incorporated to manufacture lighting equipment and kindred products. Officers are **Henrik More,** president, and **O. E. Moe,** vice-president in charge of sales, until recently in similar offices with the Moe-Bridges Company, Milwaukee.

Garrett Brass and Aluminum Foundry Company, Garrett, Ind., has been incorporated to take over the business of the same name, manufacturing brass, aluminum and other metal castings.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

SEPTEMBER 2, 1929.

Possibility of the acquisition of the **Scovill Manufacturing Company** by either the **Kennecott Mining Company** or the **Phelps-Dodge Company** continues to be discussed although officials of the local concern declare they have no knowledge of such a move. The report that Kennecott might acquire it is based on the belief that it needs two or three more fabricating plants in addition to the recently acquired **Chase Companies, Inc.,** to help consume its copper output. Its acquisition of the Chase Companies, it is felt, will render it more difficult for it to dispose of its output to concerns competing with Chase. Scovill consumes about 5,000,000 pounds of copper a month, about the same as Chase, while Kennecott produces about 80,000,000 pounds a month, of which about 30,000,000 is sold abroad, leaving about 50,000,000 to be sold here. The Chase consumption is expected to be nearly doubled when its Cleveland plant is built, but even then Kennecott will have a large surplus to dispose of.

The acquisition of the Chase Companies by Kennecott has resulted in a report being given out for the first time as to the earnings of the local concern. Hitherto, as the stock was all owned by the Chase family, no figures were ever made public. It is now reported that the earnings for the first four months of the year, after depreciation, interest and taxes, were $982,351. Earnings last year were $1,584,357. Prediction is made that earnings for the entire year of 1929 will be over $2,500,000 and probably nearly $3,000,000.

Irving H. Chase, president of the **Waterbury Clock Company,** declares his company stands ready to abide by the rulings of either the state or the national health departments if they order the discontinuance of the use of radium paint. **The United States Department of Labor** last month urged that the use of the paint be completely abolished in industry because of the danger of radium poisoning to the workers. The state health department is also making an exhaustive survey of the effects of radium paint among workers at the local plant and other clock concerns in the state. There have been several deaths among workers of the local plant, resulting from the use of the paint. However, officials point out that in all these cases the disease was contracted more than four years ago, before the present safeguards were established. Since then, there have been no cases of radium poisoning in the local plant, they say.

Edward L. Frisbie, who at the time of his death two months ago was vice-president of the **American Brass Company,** left an estate valued at over $600,000, according to the inventory filed last month. Among the stocks held were: 140 shares of **Anaconda,** valued at $16,500; 400 shares of **American Hardware** of New Britain, valued at $26,000; 100 shares of **Eastern Malleable Iron Company** of Naugatuck, valued at $9,700; and 500 shares of **Landers, Frary and Clark,** of New Britain, valued at $34,500.

Damage estimated at $20,000 resulted from a fire at the **Waterbury Battery Company** last month. The fire resulted from an explosion in the chemical laboratory followed by five other explosions which spread the fire all over the building. The building was not destroyed but most of the equipment and stock on hand was either destroyed or ruined.

Directors of the **Scovill Manufacturing Company** have declared a dividend of $1 per share payable October 1. This action is taken to mean that the stock is now on a regular $4 a year basis in addition to any extras that may be declared. The rate was 75 cents a share until July 1 when $1 was paid although at that time it was designated at 75 cents, regular, and 25 cents, extra.

W. Plumer Gretter, salesman of the **Scovill Manufacturing Company** has been promoted to the New York office. **John B. Goss,** son of **vice-president John H. Goss,** who has been in general training at the plant, has been made purveyor in the auto classification office.

James Littlejohn has been elected president of the **Scovill Foremen's Association. Arthur Taylor** has been elected vice-president; **Edward Collins,** treasurer; and **Sidney Spender,** secretary of the association. —W. R. B.

Connecticut Notes

SEPTEMBER 2, 1929.

HARTFORD—The Pratt and Whitney Aircraft Company has called for bids for the construction of a new factory unit on the 600 acre tract recently bought for it in East Hartford by its parent company, the **United Aircraft and Transport Company.** Steel construction is to start next month. Over 2,000 tons of steel will be used. When completed, the factory will be

the largest aircraft producing unit in the country. The cost is estimated in the neighborhood of $2,000,000.

The **Superior Spring and Manufacturing Company** of 373 Washington Street has purchased the unoccupied site at 397 Washington Street for a new factory building, to be completed next year, after the lease the company has on its present building expires. The lot is 60 by 150 feet and the plans call for a factory 58 by 130 feet.

The plant, buildings and land of the **Hartford Rubber Works,** division of the **United States Rubber Company,** will be sold shortly as the company has ceased operating the local plant and will move all equipment and the company's business to Detroit. Many of the skilled employes have been offered positions in Detroit if they care to move there. About 1,400 men are thrown out of employment by the factory's closing. The plant has been producing recently 9,500 tires a day. The mayor and city officials are endeavoring to provide some plan for providing employment for the large number thrown out of work.

The **Chance Vought Corporation** will build at once a large airplane manufacturing plant adjacent to the new **Pratt and Whitney Aircraft Company** plant. The new plant will employ about 400 skilled workmen and will cost about $1,000,000. The company is now located at Long Island City. **The Boeing Airplane Company** of Seattle is expected to erect an airplane manufacturing plant also adjacent to the Pratt and Whitney plant.

BRISTOL—The Bristol Brass Company is enjoying the best period of prosperity it has had since the war. Its stock is now selling at 33 to 35 a share, an increase of 100 per cent in the last 10 months. The first six months of this year showed earnings of $257,000 after depreciation write-offs but before provision for taxes, comparing with $216,000 for the corresponding period last year. Heavy charges are being made against the earnings also, as on each quarter the company is paying $1.75 on each preferred share in addition to the regular dividend in order to clean up the accumulated, unpaid dividends of the past four years. The directors expect to clean up all the unpaid dividends this year and possibly to retire the preferred stock. Even with the present heavy charges, it is said, the earnings on the common should be between $4 and $5 this year. Last year after paying dividends to the amount of $83,000 and setting up additional reserves, the surplus was increased $261,532 to a total of $625,842.

Joseph Trackey, 56, an employe of the **Dunbar Brothers Company,** was killed August 14 by the explosion of a gas furnace used in coloring springs.

NEW BRITAIN—The Stanley Works has announced that it has acquired the **R. L. Carter Company,** Inc., of Phoenix, N. Y., manufacturer of electrical portable and semi-portable tools. The purchase price has not been disclosed. The Stanley Works will operate the Carter company as heretofore under its own name. **Fred Fuller** of New Britain, connected for many years with the purchasing department of the Stanley Works, has been sent to Phoenix to manage the new company.

Patrick Harnon of this city last month completed 57 years' service with the **Russell and Erwin Company,** division of the **American Hardware Corporation.** The company's payroll shows the names of eight men who have been employed more than 50 years. They are: **Col. W. E. Parker,** 62 years' service; **Edward North,** 62 years; **Philip Burkarth,** 56 years; **Michael Price,** 53 years; **Frank Hires,** 52 years; **Aden Andrus,** 51 years; **Edward Meyer,** 50 years.

BRIDGEPORT—Nearly 300 members of the **Manufacturers' Association** held an outing at Hemlock reservoir, Easton, on August 15. The events included a clambake, quoit pitching, dart throwing, archery, sling throwing, golf driving, "flit" golf, rifle range shooting and trap shooting. The association chorus gave a musical program.

Directors of the **Dictaphone Corporation** have declared the regular dividend of $2 a share on the preferred, payable September 3 to stockholders of record August 16, and the regular dividend of 50 cents a share on the common, payable same dates.

The site of the former winter quarters of **Ringling Brothers** circus will shortly be placed on the market as an industrial site. Wrecking operations are now under way to clear the land for this purpose.

Fred Wolfe of Providence and **Fred** and **Louis Rhody** of this city were arrested August 9 for stealing copper from the **Bridgeport Brass Company. Robert Jenner,** foreman of the company, saw the men taking copper from the Housatonic Avenue plant and loading it in a car. He gave the police the car number and the car was picked up. Several thousand pounds of copper was found in the house where they have been living.

MERIDEN—Net income of the **International Silver Company** for the second quarter of 1929 amounts to $383,622 against $240,118 for the same period last year, or $3.05 per common share against $1.48. This is an increase of 59.7 per cent and earnings for the year are expected to amount to about $15 per share.

STAMFORD—The Yale and Towne Manufacturing Company reports for the quarter ending June 31, net income of $619,209 after depreciation and federal taxes, equivalent to $1.41 a share on the 440,000 shares of stock, compared with $573,854 or $1.30 a share for the preceding quarter and $451,790 or $1.03 a share for the second quarter of 1928. Net income for the first six months of this year were $1,193,000 after charges, equal to $2.71 a share, compared with $824,879 or $1.88 a share for the first half of the previous year.

NORWALK—The Segal Lock and Hardware Company of Brooklyn, N. Y., is acquiring the **Norwalk Lock Company.** A special meeting of the former has been called to provide for the acquisition, to provide funds for the elimination of the preferred stock of the Norwalk company, and to furnish additional working capital for the enlarged business. The common stock is to be increased to 400,000 shares of which only 300,000 will be outstanding. No public financing will be necessary. The Norwalk Company's products include about 4,000 items in current demand by architects, builders and the general hardware trade. —W. R. B.

Middle Atlantic States

Newark, N. J.

SEPTEMBER 2, 1929.

E. M. Grey Manufacturing Company, 358 Central Avenue, is meeting with difficulty in trying to have a $75,000 addition erected to its plant. The application for the new addition was presented some time ago but home owners in that section have objected because the plant emits offensive odors. Counsel has been engaged to fight the grant, claiming that the site is not in the industrial zone. The proposed addition will be used for casting factory. Another hearing will be given in the case.

Complaint has been made against odors coming from the plant of the **Federated Metals Corporation** at Piscatawaytown. Owners of the plant deny the charge. If the plant continues there the officials will be asked to erect a high stack to carry off the fumes. The company said it would be willing to erect a stack 250 feet in height.

The following Newark concerns have been incorporated: **William S. Rich and Son Company;** manufacture jewelry; $300,000 preferred and 5,000 shares common no par. **Universal Products Manufacturing Company;** chemicals; $125,000. **Radio Tube Products Company;** radio tubes; $10,000. **Avenue B. Chemical Company;** manufacture chemicals; $100,000. **Art Metal Guild;** brass, etc.; $100,000. **Laurent Kelly Manufacturing Corporation;** manufacture surgical instruments; $60,000. **H. C. Nutting Company of New Jersey;** chemical laboratory; $25,000. **Trutone Manufacturing Company;** manufacture radio supplies; $125,000. **Crown Manufacturing Company;** manufacture watch cases; $100,000.

—C. A. L.

Trenton, N. J.

SEPTEMBER 2, 1929.

Deputy Commissioner of Labor John Roach has reported an enrollment of more than 500 industrial plants in New Jersey in the second annual state-wide inter-plant safety contest, which began September 1. He believes that about 1,000 plants will co-operate. "The contest," Mr. Roach said, "aims to enlist interest of the industrial worker in the value of safety and care at all times. The experience of the **National Safety Council** and local councils, including that in New Jersey, in conducting contests for five years has shown definite results in accident reduction in the individual plants."

The Trenton plants manufacturing metal products are running at capacity and the owners are well pleased with the outlook. **The John A. Roebling's Sons Company** is very busy and is building a large addition to the South Broad Street plant. **The Skillman Hardware Manufacturing Company** and the **Trenton Emblem Company** are also busy.

William Bartley and Sons, Inc., Bartley, N. J., has moved part of the homestead from the main structure to use as a pattern shop. The rest of the building has been moved to another site. The company will erect another foundry on the vacant land.

Concerns just incorporated at Trenton are: **American Pulverizing Corporation,** Camden; pulverize minerals; $50,000. **Oxford Vitreous Enameling Company,** Oxford; 2,500 shares. **Birmington Guild, Inc.,** Jersey City; manufacture bronze products; 2,500 shares. **Chameleon Novelties Corporation,** Jersey City; manufacture fountain pens. **Apex Novelty Company,** Camden; manufacture wrist watches; 5,000 shares. **Universal Lamp and Novelty Company, Inc.,** Union City; manufacture lamps; 2,500 shares. **George T. Byers Manufacturing Company,** Hoboken; fountain pens; $5,000. **Mackenzie Metal Corporation of America,** Fieldsboro; manufacture metal castings; 1,000 shares common. **Columbian Art Metal Works,** West New York; 1,000 shares. **Marine Laboratories, Inc.,** Jersey City; chemicals; $125,000. **Acorn Iron and Metal Company,** Atlantic City; $125,000.

—C. A. L.

Middle Western States

Detroit, Mich.

SEPTEMBER 2, 1929.

The non-ferrous metal industry has just about held its own during the past month. There are, however, evidences of a general revival in manufacturing, particularly in the motor car plants. The airplane industry, however, has shown substantial advances all through the summer, with plenty of prospects for still further increases as the fall and winter months approach. This is going to be one of the greatest factors in the metal industry. Plants in Detroit are increasing production every month. An added feature is the manufacture of all-metal balloons. This month there was successfully launched at Detroit a dirigible entirely constructed of metal. It is described on page 420 of this issue.

The refrigeration manufacturers are continually showing progress. The plants in Detroit are increasing production every month and prospects are that this will be continued for a long time. Manufacturing jewelers are only moderately active.

The plating industry has been making progress all through the summer. Practically all plants have about all they can do.

Announcement is made that the **Chromium Plating Corporation** of Jackson, Mich., due to an increase in production, has enlarged its plant by an addition of 5,000 square feet. The new laboratory installation is of the latest type for the analysis of customers' problems as well as the company's, thus insuring uniformity in quality of plating. Due to additional orders being received, a new hard plating unit is being installed to take care of the demand for this class of work.

Ronald Van Oeyen, former office manager of the Wyandotte plant of the **Detroit Brass and Malleable Works,** has been named secretary of the **Gresser Manufacturing Company,** Detroit. This concern manufactures grease cups and other lubricating devices for automobiles and other types of motors. **Wilbert Maas,** formerly paymaster at the Wyandotte plant of the Detroit Brass and Malleable Company, has been appointed office manager.

The Bohn Aluminum and Brass Corporation in a report for the six months ending June 30, shows a net profit of $1,781,579 after charges and federal taxes. This is equivalent to $5.08 a share earned on 350,831 shares of no-par shares of capital stock. This compares with $1,644,089 or $4.70 a share on 350,000 shares outstanding in the first six months of 1928. Sales for the half year totaled $21,071,880. Net profit for the second quarter of 1929 was $761,826, after charges and federal taxes, equal to $2.17 a share on 350,831 shares of stock, comparing with $1,019,753 or $2.91 a share on 350,489 shares in preceding quarter and $825,998 or $2.36 a share on 350,000 shares in second quarter of previous year.

More and more cadmium plating is coming into use in the motor car industry. **The Lincoln Motor Car Company** is using this process in protecting bolts, nuts, screws, washers and cotter pins. However, in many instances where cadmium plating is considered not sufficiently protective, solid bronze nuts and bolts, which do not rust, are used. Cadmium is rapidly taking its place as a means of protection in practically all of the automobile manufacturing concerns.

Detroit automobile manufacturers are finding an increasing use for tungsten-carbide. Machine experts call it cheap, although it sells for $1,000,000 a ton. Its value in the automobile industry is for high-speed machine tools that retain their cutting edges. Its use thus far in the motor car plants has been confined to this purpose. Because of its cost and its brittleness, it is used at present only in small pieces joined to conventionally shaped steel tools. "It does not solve every machining problem," says **E. F. Roberts,** vice-president of manufactured for the **Packard Motor Company.** "It does however, do a lot of work we once thought impossible. Seconds are of vital importance in the countless machining operations necessary in building motor cars. Perhaps that is why the automobile industry is so interested in watching the development of tungsten-carbide tools."

The Lockheed Aircraft Company, a subsidiary of the Detroit **Aircraft Corporation,** is now operating 47 hours a week instead of 45 hours as has been the rule in the past. This new system is a step towards perfecting standardized production on an economical basis, according to company officials.

The Fokker Aircraft Corporation of America, in which the **General Motors Corporation** recently acquired a 400,000 share interest, estimates its total volume of business this year at $6,000,000, or triple the 1928 gross. It is announced that the company will maintain capacity production during the remainder of the year.

—F. J. H.

Toledo, Ohio

SEPTEMBER 2, 1929.

There seems to have been a moderate slowing up of all lines of industry in the Toledo area during the last few weeks. This also includes plating and the brass, copper and aluminum industries. Much of this decline may be found in the automobile accessory plants.

Employment in the 51 factories reporting weekly to the **Merchants' and Manufacturers' Association,** which includes many representatives of the non-ferrous field, indicate there are at the present time 30,950 persons on plant pay rolls. One year ago the same concerns employed 33,623. It is expected the high mark at this time a year ago will be reached in a short time.

President Pratt E. Tracy has announced that all dealers and representatives of the **Airway Electric Appliance Corporation,** will be covered by insurance under the group plan to become effective October 1. The announcement met with enthusiastic response when the company's more than 1,000 employes held their annual outing at Put-In-Bay recently.

—F. J. H

Cleveland, Ohio

SEPTEMBER 2, 1929.

Manufacturing in this area, particularly that pertaining to the non-ferrous metal industry and plating, is not quite so brisk as it was a few weeks ago. This condition is only seasonal and is no more outstanding than it was a year ago.

A new four-passenger, two-motored biplane is nearing completion by the **Great Lakes Aircraft Corporation** of Cleveland, with three more slated for completion a short time later, according to **Benjamin F. Castle,** president. De Luxe equipment will be provided throughout, making these amphibians ideal private yachts as well as practical for business use.

Col. **Charles P. Ayres,** vice-president of the **Cleveland Trust** Company, a noted business prognosticator, has the following to say about the motor car industry: "The automobile industry has, to some extent, made its rapid strides in past years by a process of systematically turning to new devices and designs tending to increase its market. The self-starter accomplished this once; four-wheel brakes another time; balloon tires another, and closed bodies yet another. New developments are again being spoken of in the industry as probabilities rather than possibilities. Among these are the front wheel drive." —F. J. H.

Illinois Notes

SEPTEMBER 2, 1929.

The **Standard Stamping and Perforating Company,** Chicago, has leased 25,000 square feet of ground on West 49th place, east of South Kedzie Avenue in the Kenwood manufacturing district. The lease is for twenty-one years with option of purchase. A one-story building is being erected by the company.

The **Vulcan Ingot Metal Company** has increased its capital stock from $50,000 to $100,000.

The **Albany Park Sheet Metal Work** is a new Chicago corporation with a capital of $2,000. The company deals in sheet metal, furnaces, etc. Signers of the articles of incorporation are **Sam** and **Abe Karlov** and **Samuel Winter.**

The **National Concrete Metal Forms Company,** manufacturer of metal forms used in concrete construction, has leased 40,000 square feet on industrial property at 6510 W. Sixty-sixth place. At present the firm is located at 2300 W. Fifty-eighth street, but plans to occupy its new quarters at an early date. —A. P. N.

Wisconsin Notes

SEPTEMBER 2, 1929.

Establishment by the **Rundle Manufacturing Company,** Milwaukee, of a plant at Camden, N. J., has been announced by Henry Held, president. Work on the plant, costing about $1,000,000, is under way on a recently acquired nine-acre site. It will be all one-story, containing 240,000 square feet of space. The Milwaukee plant of the Rundle company consists of a complete foundry and enameling plant. Output will be almost doubled with the completion of the new plant at Camden it was stated.

The General Bronze Corporation, Long Island City, N. Y., has completed negotiations whereby it has acquired, through exchange of stock, the **Wisconsin Ornamental Iron and Bronze Company** of Milwaukee, one of the state's largest bronze manufacturers. The Milwaukee plant will be expanded and **E. A. Ernest,** president, will continue in charge, it was stated. The Milwaukee company was founded in 1894 by **G. H. Norris** and has a sales volume of more than $1,000,000 a year.

What is believed to be the largest shears in Greater Milwaukee have recently been installed at the **Roberts Brass Company** plant. The shears weigh 26,400 pounds and have no difficulty in cutting through a copper strip one-half inch in thickness. **Robert C. Zannoth** is president and general manager of the Roberts Brass company.

A consolidation in the Kenosha factory of the **Specialty Brass Company,** through a transfer of the company's plant at Albion, N. Y., to Kenosha, has increased the payrolls of the Kenosha factory 20 per cent and has concentrated manufacturing activities to a point where 1929 production will show a 33 per cent increase over 1928. The Kenosha plant of the Specialty Brass Company was established in 1907 by the four **Anderson Brothers,** who, with **Martin Pedersen,** vice-president of the company, make up the executive board of the organization. **C. M. Anderson** is president; **C. W. Anderson,** secretary and treasurer, and **Nels Anderson** and **Henry Anderson,** directors. —A. P. N.

Other Countries

Birmingham, England

AUGUST 19, 1929.

During the last month the non-ferrous metal rollers of this district have experienced a lack of new business and the mills in many cases have kept going on old orders without adding substantially to the books. The busiest department has been that of brass and copper tubes and the makers still find a very good demand for these materials in connection with house building. The pressure for delivery has relaxed somewhat, now that it is known that under the new government the housing subsidy will be renewed and it is therefore likely that many new building schemes will be launched. Since the beginning of the year, the non-ferrous makers and engineers have collaborated to improve the plant rolling brass and copper with a view to longer lengths and more exact thicknesses so as to provide a better finish such as is demanded nowadays by prospective customers. It is stated that some satisfactory results have accrued. Prices have been reduced a farthing during the month on brazed brass and copper tubes as a result of decreases in raw copper.

The report of the **Assay Master** to the **Guardians of the Standard of Raw Plate** in Birmingham gives details of silver and gold wares assayed during the year. Twelve months ago it was possible to record that more silver wares had been marked than in any year since 1920 taking the aggregate weight as the basis of comparison. The progress of these years has not been maintained during the year under review. The figures to June 30 show a falling off both in gold and silver wares marked when contrasted with those of 1928. Comparative figures going back to 1919 are given in the return and during that period so far as gold wares are concerned last year's total of 311,416 ounces assayed and marked is the smallest recorded. It is stated there has been some recovery during July especially in the case of silver ware. The number of silver wares assayed and marked was 2,852,157 as compared with 2,897,603 in 1928.

A very attractive program has been drawn up in connection with the Metallurgical congress which the **British Institute of Metals** is holding in Düsseldorf from September 9 to 12. At the two business sessions 14 technical papers will be presented for discussion. Following the meetings visits will be paid to works in Düsseldorf and neighborhood and to the **Düsseldorf Foundry Exhibition.** Following the Düsseldorf meeting supplementary visits will be paid on September 13 and 15, the first to Berlin and the second to Holland. The latter will be entirely of a sightseeing character but in Berlin visits will be paid to works as well to the Technical High School at Charlottenburg and to the government testing laboratory.

The Birmingham Jewellers and Silversmiths Association has presented to the **British Museum** an openwork gold plaque of **Amenemhet IV,** one of the many treasures found in Egypt and said to be one of the most interesting of the smaller Egyptian antiquities recently acquired by the museum. It is nearly 4,000 years old and the purchase is the outcome of some instructive lectures to the Association by **J. R. Ogden,** a jeweller and silversmith of Harrogate and a gentleman with a considerable knowledge and experience of Egyptian antiquities. He was associated with **Howard Carter** in the excavation of the tomb of **Tutankhamen** and he also went on an expedition to Ur of the Chaldees. The plaque is complete with the exception of a single sign at the end of the inscription which has

been broken off. It is a beautiful example of the goldsmiths' work of its time, being cut apparently out of a flat sheet of thin gold with a very sharp instrument and the details on the dress of the figures added afterwards with the graver. The Association purchased the plaque for £120.

A good representative display of non-ferrous metals was seen at the **North East Coast Exhibition** recently held. Among the firms exhibiting was the **Yorkshire Copper Works,** with a remarkably comprehensive display of solid drawn tubes in brass, copper, cupro nickel, phosphor bronze and aluminum bronze. **Allen Everitt and Sons** of Birmingham showed condenser tubes in different non-ferrous alloys and specimens of rolled metal. A very varied collection of products in non-ferrous metals was to be found in the exhibit of **Imperial Chemical Industries,** a huge combine taking in many well-known works both in Birmingham and outside. The **Vickers Armstrong** exhibit included castings made in their P. M. G. brass, a metal of which the yield point and other physical properties are said to be much better than those of gunmetal.

Henry Wiggin and Company, Ltd., of Birmingham, a very well-known non-ferrous metal works, founded in 1835, has experienced an increasing demand for nickel alloys and has found it necessary to acquire further sites. The Ladywood works now extend the full length of Wiggin Street. New mills covering 12,800 square yards are being erected and their construction gives work to about 100 men. As a result of the fusion of interests between the **Mond Nickel Company, Ltd.,** and the **International Nickel Company of Canada, Ltd.,** every employe of **Henry Wiggin and Company** comes under a pension scheme which is generous in its benefits since the funds are provided wholly by the company and no contributions are made by employes.

—J. A. H.

Business Items — Verified

Doehler Die Casting Company, Batavia, N. Y., has installed an electric furnace for heat treatment of aluminum castings, according to **W. R. Ahrberg,** assistant manager.

Mueller Brass Company, Port Huron, Mich., has opened a district sales office at 4590 Euclid Avenue, Cleveland, Ohio, to cover the northern Ohio territory. **Wallace C. Young** is the Cleveland representative.

The Central Brass and Aluminum Foundry Company, 503 South 21st Street, St. Louis, Mo., **F. T. O'Hare,** president, has completed an addition to its plant which will enable the company to increase production 50 per cent.

Specialty Manufacturing Company, 10698 Brea Road, Cleveland, Ohio, has completed a new addition to its brush manufacturing plant to take care of increased demand for its products. Capacity has been doubled by the new addition.

International Nickel Company, New York City, declared quarterly dividend of 25 cents a share on its common stock, payable September 30 to stock of record August 31, 1929, placing the stock on a basis of $1 annually as against 80 cents previously paid.

Pittsburgh Valve and Fittings Company, Barberton, Ohio, has entered into a co-operative group life insurance plan with the Metropolitan Life Insurance Company, covering its 600 employes with $600,000 of life insurance, paid for jointly by company and workers.

Morgan Brass Foundry, Lincoln Avenue, Providence, R. I., destroyed by fire a short time ago, plans construction of a new plant and will be in market for hoisting equipment, furnaces and general brass foundry equipment and supplies. Company casts brass, bronze and aluminum.

Napier Company, Meriden, Conn., jewelry and novelty manufacturers, have remodeled their plant completely at a cost of $150,000. Plant has been thoroughly modernized with new equipment, including a new lacquering room, vault, heating devices, machinery of various kinds, electrical apparatus, etc.

Johnson-Carlson Tank Company, Chicago, Ill., manufacturers of wood tanks, announce the appointment of **Weaver Brothers Company,** Adrian, Mich., as exclusive sales representatives in the metal pickling field. Weaver Brothers Company have for some years been specializing in a complete line of pickling supplies for the trade.

Faries Manufacturing Company, Decatur, Ill., manufacturer of electric fixtures, is erecting a one-story addition, 80 by 240 ft., to its plant. The company operates a brass, bronze and aluminum foundry, brass machine shop and tool room, spinning and stamping departments, does soldering, brazing, plating, polishing, grinding, lacquering.

The Chromium Plating Corporation, Jackson, Mich., has added 5,000 sq. ft. of floor space to its plant to provide for increased activities. The company has made a new laboratory installation of latest type for analysis of its own and customers' problems to insure uniformity of deposition. A new hard plating unit is being installed to care for new orders for this class of work.

The National Chromium Corporation, 200 Varick Street, New York City, producer of "Enseco" chromium plate, is adding new polishing equipment in order to meet the needs of its rapidly expanding business. Heretofore 64 polishers have been operating; the new machinery will permit the employment of 128 polishers, according to Sidney Satenstein, president of the company.

Higert Chrome Company, 2019 Spruce Street, Detroit, Mich., has established as a complete electroplating consulting service for manufacturers. The company is headed by **H. Higert,** president, formerly connected with the General Chromium Corporation as shop manager. The company is prepared to install plants and to give complete operating instruction and advice. **J. L. Watson** is secretary and treasurer.

Central Brass Foundry, Neenah, Wis., recently organized by A. M. Schnetzer, for fifteen years superintendent of the **Neenah Brass Works,** and **John W. Hewitt,** one of the owners of the **Hewitt Machine Company,** Neenah, will open a new foundry at Menasha, Wis., to specialize in jobbing work on paper and sulphite mill machinery. Mr. Schnetzer will be in charge of the new company, having disposed of his interest in the Neenah Brass Works.

The Bellevue Industrial Furnace Company, Detroit, Mich., has added an electric furnace division to its plant manufacturing a complete line of combustion furnaces. **Arnold Pfau,** formerly connected in a consulting capacity with the **Globar Corporation,** has taken charge of the electric furnace division for the manufacture and sale of Globar equipped high temperature furnaces and medium temperature furnaces with nickel-chromium resistors.

General Bronze Company, 3212 Smallman Street, Pittsburgh, Pa., has enlarged the capacity of its machine shop by installation of new machinery, including boring mills, lathes, drill presses, milling machines, etc. A patented centrifugal molding machine is being installed. Melting capacity is being doubled and will be ready before the month is over. The company made extensive additions about the beginning of the year, to which the present improvements have already been found necessary.

Smith Engineering Corporation, 429 Cambridge Street, Boston, Mass., industrial engineers, manufacturing compressors, air filters, piping, steam units, etc., is in the market for pressure gauges, pop safety valves, fusible plugs, compressed air tanks, drain valves and check valves. The company, according to **H. R. Smith,** president, is seriously contemplating entering into the manufacture of garage compressor units, having heretofore manufactured units for the industrial field only.

Midwest Carbide Corporation, Keokuk, Iowa, has been organized to manufacture calcium carbide by **National Lead Company and Shawinigan Products Corporation.** The company takes over the calcium carbide manufacturing activities formerly carried on by the United Lead Company, National Lead subsidiary. Officers of the new company are: President, **E. J. Cornish,** president of National Lead Company; vice-president and general manager, **L. F. Loutrel,** vice-president of Shawinigan Products Corporation; vice-president, **T. F. Wettstein,** formerly of United Lead Company.

Day Name Plates, Ltd., 4 Woodfield Road, Toronto, 8, Canada, has changed its name to **Metal Etchers and Manufacturers, Ltd.,** and will henceforth be located at 514 King Street East, Toronto, 2, Canada, where the company has acquired the plant of **The Toronto Iron Works, Ltd.,** at a

cost of $77,500. The building contains about 21,600 sq. ft., about three times the floor space of the old works. The company, which makes etched name plates and other metal products, plans to increase the scope of its lines. There will be no change in management, the new company being still under active charge of **R. E. Wakefield** and **L. S. Day**, sole owners. Ample room for expansion has been acquired with the new plant.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

SEPTEMBER 2, 1929.

The policy of restricted buying which has been pursued since spring and which was discussed last month, came definitely to an end promptly on August 1st. At that time consumers of copper came into the market and started purchasing in quantity. More copper was sold during the first ten days for shipment abroad than during the entire preceding month. Domestic consumers also started purchasing soon after the first of the month and it is believed that the record for the month of August will show very large sales of copper. It is believed, now that purchasing of copper has started again both in this country and abroad, that it will continue and that current production will all be sold. Stocks of copper are not abnormally large when it is considered that with the present demand for copper there exists only about twenty days' supply.

Brass mills were catching up with their orders last month but right at the moment new business is coming in in excellent volume and unfilled tonnages are on the increase. Demand for copper wire and cable continues unabated and there is every indication that September will be a banner month. There does not seem to be any sign of business slowing down. Every indication at present is that this Fall will see extreme business activity.

As the price of copper has not fallen below 18c during the summer months, when confidence in the market was lacking and new business was somewhat curtailed, it is hardly to be expected that the price of copper will be reduced when the demand picks up as it has during August. On the other hand, sight must not be lost of the fact that production is lower than earlier in the year, that stocks are higher and that the industry has had a hard time again building up confidence in the situation. Therefore no material increase in the price is to be looked for either. It would seem that the price of 18c per pound is reasonable. Certainly all users of copper and its products welcome a reasonable price that does not fluctuate erratically.

The nickel situation has not changed materially from that existing last month. Prospective purchasers of nickel would do well to keep their requirements well covered. This situation is not one that will cure itself overnight as it means the development of additional facilities for turning out the metal and this is not the work of a month or even six months. More nickel is being used every day and there is no sign of a let up in the demand.

Monel metal in ingots and fabricated forms is obtainable, but it is rather difficult to secure immediate delivery of certain sizes. It is advisable, if possible, to anticipate requirements, according to advices in the trade.

Now that the month of August is past and we are entering the Fall, every one knows that seasonal slackening has been very much less than usual. The way business is picking up it is almost certain that activity all along the line will be extraordinary this Fall.

Metal Market Review

By R. J. HOUSTON
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

SEPTEMBER 2, 1929.

Conditions in the copper market have continued consistently firm. This is clearly indicated by an unbroken price level of 18 cents delivered to Connecticut Valley points and 18.30 cents c. i. f. European ports.

On the basis of these figures, the export sales in August were particularly heavy. Domestic buying was also on a substantially improved scale compared with that of a few weeks ago. Recent movements, therefore, reflected the more pronounced confidence that has been evident in the copper situation lately.

An enormous and expanding American consumption combined with a heavy overseas demand have furnished an excellent foundation for a strong copper situation. The high rate of domestic consumption represents the major influence in the present strong position of the metal.

Deliveries of copper to the home trade during the first seven months of this year totaled 1,383,076,000 pounds as compared with 1,052,546,000 pounds for the corresponding period last year, thus showing an increase of 31 per cent. It is obvious that both foreign and domestic consumers have adopted a more liberal buying policy commensurate with the heavy volume of requirements. This was evidenced by the very large orders booked in the last half of August.

Recent buying for domestic account was the largest in many months. Foreign demand during the month was also on a more urgent scale.

ZINC

Price movements in the zinc market were within a narrow range in August. The variations in quotations showed clearly that there were no developments to bring about aggressive demonstrations in the situation. There was a moderate amount of buying, but not enough concentrated demand to provide the basis for a strong upward movement. Recent sales were made at 6.75c and 6.80c East St. Louis, with demand mainly for nearby shipment. The New York basis for Prime Western quotes 7.15c for prompt and a shade less for future delivery.

TIN

Trading in tin was specially quiet the last half of August and prices developed a sagging tendency. At the beginning of the month prompt Straits tin sold at 47c to 47⅛c, but subsequent dullness had a weakening effect on the market and nearby Straits tin sold at 46c. The reactionary tendency did not create a very large response from consumers, and business recently was on a restricted scale. Consumption, however, is large and supplies appear to be in strong hands. American tin deliveries are much greater than they were last year. Total domestic deliveries for the first seven months of 1929 amounted to 54,955 tons, a gain of 10,950 tons, or nearly 25 per cent, over the deliveries in the corresponding period of 1928. A new high record in American tin consumption has been made this year. As this country consumes about 60 per cent of the world's supply, an area of good business here will continue to prove a veritable boon to the tin industry of

the world. A record breaking output of tin is more than keeping step with expanding consumption. The increase in production is highly impressive. This is a significant fact about tin and accounts for the less sensational fluctuations in market values lately.

LEAD

Decided activity and firmness developed in the lead market in the closing days of August. Increased buying for nearby shipment rose to a heavy scale and gave a stronger undertone to the situation. New business also came in for large volume tonnage to cover September and October requirements, and this greater demand indicated that consumers are in actual need of fresh supplies in view of the usual enlarged Autumn operations. The formation of a lead producers' international association to promote greater stability in this commodity has also created better sentiment. There is, consequently, a likelihood that the market may stiffen. Heavy sales were made in the closing days of the month. The greater demand reflects a big outlet for production, and the movement into consumption is such as to provide the basis for fundamental firmness. Prices at month-end remained firm at 6.55c East St. Louis and 6.75c New York.

ALUMINUM

Active demand continued for aluminum during the past month, and indications multiply that consumption for the balance of the year will be on a heavy scale. The market appears to be in a strong and stabilized position, and requirements for the coming months are expected to register high from the automobile industry and other important users of the metal. New aluminum alloys are being tested out in aircraft industry and other manufactures, and these experimental performances are likely to lead to increased demand annually. Developments indicate increased use of aluminum products.

ANTIMONY

The market position of antimony is firmer than it was a short time ago and price has advanced about half a cent per pound in the last few weeks. Consumers and dealers displayed more interest and trading at times was active. The strengthening of market tone brought out considerable demand. Talk of increased duty under new tariff regulations also had some influence with buyers. The proposal of an indeterminate rate of duty on imports would act as a handicap on normal business. China is the chief source of supply, and a change from a specific duty, as at present, to a rate that varies from ½c to 4c per pound is one that would unquestionably obstruct and complicate trading in antimony. It is obviously and wholly illogical, and the proposed schedules are undeserving of general approval by the trade at large. The latest available figures show that the bonded stocks of antimony in this country were 2,599,224 pounds on July 1, being an increase of 295,702 pounds from the quantity on June 1. The market for Chinese regulus is quotable at 8¾c to 9c duty paid.

QUICKSILVER

A more active inquiry is reported for quicksilver. Buying interest developed on a larger scale lately, and market tone is firmer with a price range of $124.50 to $125 per flask of 75 pounds.

PLATINUM

The situation in platinum does not appear to have undergone any special change, although the quotation for refined is slightly lower at $62.50 per ounce.

SILVER

The silver market remained comparatively dull, and there are no signs of pronounced improvement in price. China operated both as seller and buyer, but not extensively enough to have much influence on values. India bought on a moderate scale. Broad interest is lacking, and some favorable factor seems necessary to lift silver out of its depressed condition and infuse new life into the situation.

OLD METALS

Greater firmness dominates the market for scrap copper, following active and firm conditions in the primary market. Domestic buyers and exporters showed increased interest, and best grades of copper advanced to 16¼ cents. Demand for copper wire was specially good, and activity was also reported for light copper at the usual differential. Brass grades were moving in fair volume, but were relatively less in demand. Lead showed some improvement and generally speaking many of the active scrap metals were firmer. The buying basis at New York was 15¾c. to 16c for crucible copper, 13c to 13¼c for light copper, 8c to 8¼c for heavy brass, 7c to 7½c for light brass, 4¾c to 5c for heavy lead, and 17¼c to 18c for aluminum clippings.

Daily Metal Prices for the Month of August, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	5	6	7	8	9	12	13	14	15	16	19
Copper c/lb. Duty Free													
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. N. Y.)	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.375	17.50	17.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.80	6.80	6.75	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80
Brass Special	6.90	6.90	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85
Tin (f. o. b. N. Y.) c/lb. Duty Free.													
Straits	47.125	47.125	47.375	47.125	47.00	47.00	46.625	46.50	46.375	46.50	46.50	46.625	46.875
Pig 99%	46.75	46.875	47.00	46.875	46.625	46.625	46.25	46.125	46.00	46.125	46.125	46.25	46.45
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	35	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.625	8.625	8.625	8.625	8.625	8.625	8.75	8.75	8.75	8.75	8.75	8.875	8.875
Silver :/oz. Troy Duty Free	52.625	52.625	52.625	52.625	52.50	52.25	52.50	52.50	52.50	52.50	52.50	52.75	52.625
Platinum $/oz. Troy Duty Free	64	64	64	64	64	64	64	64.00	64.00	62.50	62.50	62.50	62.50

	20	21	22	23	26	27	28	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125	18.125
Electrolytic (f. a. s. N. Y.)	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Casting (f. o. b. N. Y.)	17.50	17.625	17.625	17.625	17.625	17.75	17.625	17.625	17.625	17.75	17.375	17.489
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.75	6.798
Brass Special	6.85	6.85	6.85	6.85	6.90	6.90	6.90	6.90	6.90	6.90	6.85	6.866
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	46.625	46.50	46.625	46.70	46.375	46.125	46.125	46.125	46.25	47.375	46.125	46.645
Pig 99%	46.25	46.125	46.25	46.35	45.875	45.75	45.50	45.50	45.625	47.00	45.50	46.243
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55
Aluminum c/lb Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.875	8.875	9.00	9.00	9.00	9.00	9.00	8.875	8.75	9.00	8.625	8.801
Silver c/oz. Troy Duty Free	52.625	52.625	52.875	52.625	52.625	52.75	52.625	52.625	52.625	52.875	52.25	52.597
Platinum $/oz. Troy Duty Free	62.50	62.50	62.50	62.50	62.50	62.50	62.50	62.50	62.50	64.00	62.50	63.114

Metal Prices, September 9, 1929

NEW METALS

Copper: Lake 18.375. Electrolytic 18.25. Casting, 17.875.
Zinc: Prime Western, 6.80. Brass Special, 6.90.
Tin: Straits, 45.50. Pig, 99%, 44.75.
Lead: 6.70. **Aluminum,** 24.30. **Antimony,** 8.65.
Nickel: Ingot, 35. **Shot,** 36. **Elec.,** 35. **Pellets,** 40.
Quicksilver: flask, 75 lbs., $125. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 51.75.
Gold: oz,. Troy, $20.67. **Platinum,** oz., Troy, $62.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¾to14
Brass Ingots, Red	15¾to16¾
Bronze Ingots	16¾to20
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	27 to39
Manganese Bronze Ingots	15 to20
Manganese Bronze Forging	35 to43
Manganese Copper, 30%	30 to40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	19 to22
Phosphor Copper, guaranteed 15%	21 to24
Phosphor Copper, guaranteed 10%	20 to23
Phosphor Tin, no guarantee	55 to70
Silicon Copper, 10%, according to quantity	30 to35

OLD METALS

Buying Prices		Selling Prices
15⅜to15½	Heavy Cut Copper	16⅜to16½
14⅛to14⅝	Copper Wire, mixed	15⅛to15⅝
12½to13½	Light Copper	13½to14½
12 to12½	Heavy Machine Composition	13 to13½
8¼to 9	Heavy Brass	9¼to10
7 to 7½	Light Brass	8 to 8½
9½to10	No. 1 Rod Brass Turnings	10½to11
11¼to11¾	Composition Turnings	12¼to12¾
5⅜to 5⅝	Heavy Lead	6⅛to 6⅜
3¼to 3¾	Zinc Scrap	4¼to 4¾
8 to 8½	Scrap Aluminum Turnings	12 to12½
11½to12	Scrap Aluminum, cast alloyed	15½to16
17 to18	Scrap Aluminum sheet (new)	20 to21
31 to33	No. 1 Pewter	36 to39
20 to21	Old Nickel Anodes	22 to23
20 to23	Old Nickel	22 to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....27¾c. to 28¾c. net base
From Stock .....28¾c. to 29¾c. net base

BARE COPPER WIRE

19⅞c. to 20⅛c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

SOLDERING COPPERS

300 lbs. and over in one order .....26¼c. net base
100 lbs. to 200 lbs. in one order .....26¾c. net base

ZINC SHEET

Duty sheet, 2c., per pound	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	10.25 net base
Casks, jobbers' price	10.50 net base
Open casks, jobbers' price	11to11.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 53.75 c. per ounce, Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.23¼	$0.25	$0.26¼
Wire	.23¾	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30⅞	....	.35⅞
Open seam tubing	.31¼	....	.34¼
Angles and channels	.31¼	....	.34¼

BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	25¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	24c. net base
Muntz or Yellow Rectangular sheet other Sheathing	25c. net base
Muntz or Yellow Metal Rod	22¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	31⅜c.	10% Quality	34⅛c.
15% Quality	33c.	15% Quality	37¾c.
18% Quality	34¼c.	18% Quality	41c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, September 9, 1929

ANODES

Copper: Cast	28c.	per lb.
Rolled, oval	27c.	per lb.
Rolled, sheets, trimmed	27¾c.	per lb.
Brass: Cast	27c.	per lb.
Zinc: Cast	12½c.	per lb.

Nickel: 90-92%	45c.	per lb.
95-97%	47c.	per lb.
99%	49c.	per lb.

Silver: Rolled silver anodes .999 fine are quoted from 53¼c., Troy ounce, upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/28 Unbleached	$28.27 to $28.30
14" 20 ply 64/68 Unbleached	36.45 to 37.34
12" 20 ply 80/92 Unbleached	31.25 to 34.16
14" 20 ply 80/92 Unbleached	42.40 to 46.09
12" 20 ply 84/92 Unbleached	36.60 to 39.31
14" 20 ply 84/92 Unbleached	49.60 to 57.60
12" 20 ply 80/84 Unbleached	38.35 to 39.37
14" 20 ply 80/84 Unbleached	52.00 to 53.12
Sewed Pieced Buffs, per lb., bleached	52c. to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.14-.15
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.19½
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.03
Alcohol—Butyl	lb.	.16¾-.21¼
Denatured, drums	gal.	.49-.59
Alum—Lump, Barrels	lb.	.0385
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	3.3
Aluminum chloride, solution in carboys	lb.	.06½
Aluminum—Sulphate, tech., bbls.	lb.	.33
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.29
Chromic Sulphate	lb.	.30-.50
Copper—Acetate (Verdigris)	lb.	.25
Carbonate, bbls.	lb.	.21½
Cyanide (100 lb. kgs)	lb.	.45
Sulphate, bbls.	lb.	6.7
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.13
Salts, double, 425 lb. bbls.	lb.	.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	42½
Cyanide (fluctuating)	oz.	.54-.56
Nitrate, 100 ounce lots	oz.	.36½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.37
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½